JET PROPULSION

Journal of the

AMERICAN ROCKET SOCIETY

Rocketry . . . . Jet Propulsion Sciences . . . . Astronautics

VOLUME 26 **JULY 1956** (In Two Parts) **NUMBER 7, PART 1**

Kaman HTK-1 leads helicopter review . . . p. 583

REPORT ON ARS SEMI-ANNUAL MEETING IN CLEVELAND—SEE PAGE 587

Scope of JET PROPULSION

JET PROPULSION, the Journal of the American Rocket Society, is devoted to the advancement of the field of jet propulsion through the publication of original papers disclosing new knowledge and new developments. The term "jet propulsion" as used herein is understood to embrace all engines that develop thrust by rearward discharge of a jet through a nozzle or duct; and thus it includes systems utilizing atmospheric air and underwater systems, as well as rocket engines. JET PROPULSION is open to contributions, either fundamental or applied, dealing with specialized aspects of jet and rocket propulsion, such as fuels and propellants, combustion, heat transfer, high temperature materials, mechanical design analyses, flight mechanics of jet-propelled vehicles, astronautics, and so forth. JET PROPULSION endeavors, also, to keep its subscribers informed of the affairs of the Society and of outstanding events in the rocket and jet propulsion field.

Limitation of Responsibility

Statements and opinions expressed in JET PROPULSION are to be understood as the individual expressions of the authors and do not necessarily reflect the views of the Editors or the Society.

Subscription Rates

One year (twelve monthly issues)	\$12.50
Foreign countries, additional postage ... add	.50
Single copies	1.25
Special issues, single copies	2.50
Back numbers	2.00

Change of Address

Notices of change of address should be sent to the Secretary of the Society at least 30 days prior to the date of publication.

Information for Authors

Preparation of Manuscripts

Manuscripts must be double spaced on one side of paper only with wide margins to allow for instructions to printer. Submit two copies: original and first carbon. Include a 100–200 word abstract of paper. The title of the paper should be brief to simplify indexing. The author's name should be given without title, degree, or honor. A footnote on the first page should indicate the author's position and affiliation. Include only essential illustrations, tables, and mathematics. References should be grouped at the end of the manuscript; footnotes are reserved for comments on the text. Use American Standard symbols and abbreviations published by the American Standards Association. Greek letters should be identified clearly for the printer. References should be given as follows: For Journal Articles: Authors, Title, Journal, Volume, Year, Page Numbers. For Books: Author, Title, Publisher, City, Edition, Year, Page Numbers. Line drawings must be made with India ink on white paper or tracing cloth. Lettering on drawings should be large enough to permit reduction to standard one-column width, except for unusually complex drawings where such reduction would be prohibitive. Photographs should be clear, glossy prints. Legends must accompany each illustration submitted and should be listed in order on a separate sheet of paper.

Security Clearance

Manuscripts must be accompanied by written assurance as to security clearance in the event the subject matter of the manuscript is considered to lie in a classified area. Alternatively, written assurance that clearance is unnecessary should be submitted. Full responsibility for obtaining authoritative clearance rests with the author.

Submission of Manuscripts

Manuscripts should be submitted in duplicate to the Editor-in-Chief, Martin Summerfield, Professor of Aeronautical Engineering, Princeton University, Princeton, N. J.

Manuscripts Presented at ARS Meetings

A manuscript submitted to the ARS Program Chairman and accepted for presentation at a national meeting will automatically be referred to the Editors for consideration for publication in JET PROPULSION, unless a contrary request is made by the author.

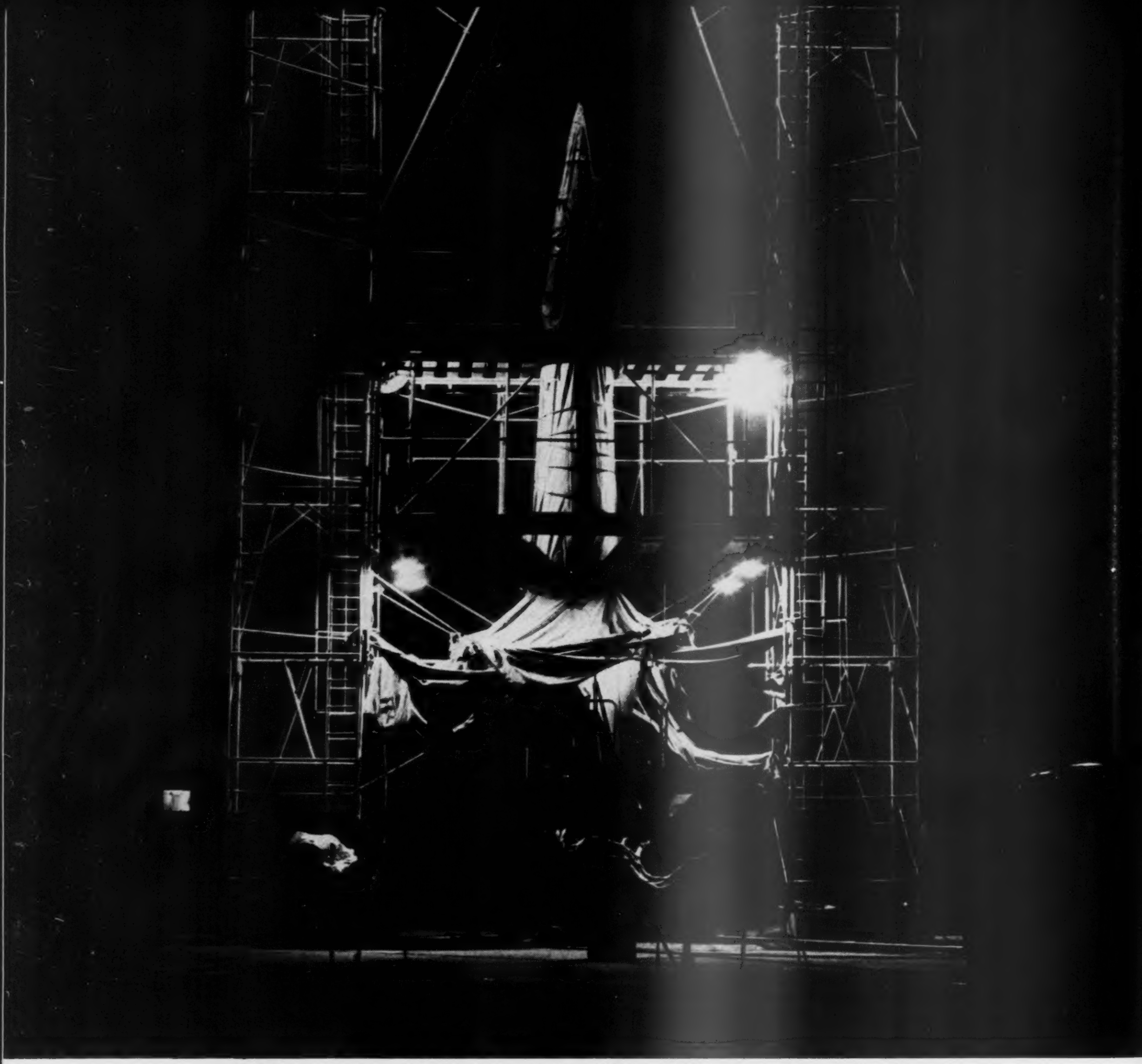
To Order Reprints

Prices for reprints will be sent to the author with the galley proof, and orders should accompany the corrected galley when it is returned to the Editorial Assistant.

JET PROPULSION

Journal of the AMERICAN ROCKET SOCIETY

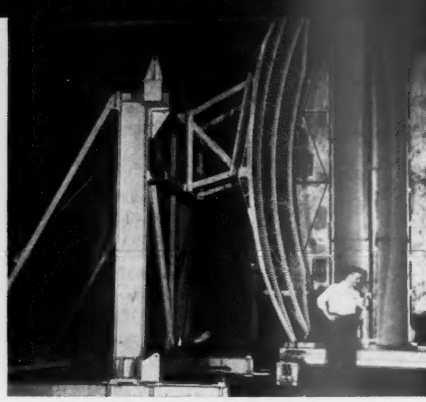
JET PROPULSION, the Journal of the American Rocket Society, published monthly by the American Rocket Society at 20th and Northampton Streets, Easton, Pa., U.S.A. The Editorial Office is located at 500 5th Ave., New York 36, N. Y. Price \$1.25 per copy, \$12.50 per year: Entered as second-class matter at the Post Office at Easton, Pa., under the Act of March 3, 1879.



ZERO minus 4 hours! A G-E test missile, still shrouded in the early morning dampness before launching, represents more than a decade of research and development.

THESE G-E CAPABILITIES ARE AVAILABLE TO NEW

BASIC RESEARCH



COMMUNICATIONS

HYPERSONICS

JULY 1956

VOLUME 26 NUMBER 7

JET PROPULSION

Journal of the

AMERICAN ROCKET SOCIETY

Editor-in-Chief

MARTIN SUMMERFIELD

The Application of the Shock Tube to the Study of the Problems of Hypersonic Flight[1]

A. HERTZBERG[2]

Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y.

This paper discusses some of the new scientific and technical problems introduced by the high temperature conditions encountered in hypersonic flight. Modifications of the shock tube which have been studied at Cornell Aeronautical Laboratory for the investigation of these problems are presented. The shock tube is one of the few laboratory instruments capable of generating the high temperature conditions in air encountered in hypersonic flight studied. The conventional shock tube is limited since the maximum flow Mach number that can be achieved behind a normal shock wave in air is approximately 3. When the conventional shock tube is terminated by an expansion nozzle, high Mach number flows can be achieved as well as high stagnation temperatures. Actual flow conditions can therefore be closely simulated for the investigation of heat transfer rates and other aerodynamic problems. The application of the shock tube to other areas of high temperature research is briefly discussed. In particular, a technique for the study of high temperature chemical reaction rates is described.

Introduction

FLIGHT within the earth's atmosphere at Mach numbers of 10 and above introduces a number of new and interesting scientific and technical problems not associated with flight at lower Mach numbers. The most important of these problems arise from the extremely high temperatures which are encountered in the field of flow around a body resulting from the conversion of the kinetic energy associated with the flight velocity into thermal energy across the shock wave. At the high temperatures the thermal energy or enthalpy of the air is sufficient to excite the higher vibrational states of the diatomic molecules, produce dissociation of the nitrogen and oxygen molecules, cause chemical reactions such as the formation of nitric oxide, and induce thermal ionization of some of the molecular and atomic species of which the air is composed.

The investigation of hypersonic flight problems is complicated by the changes in gas composition which occur at these high temperatures. Fig. 1 shows the maximum temperature encountered at the forward stagnation point on a blunt nosed, perfectly insulated body at hypersonic velocities. As can be seen in this figure, at a flight Mach number of 16 the stagnation temperature is equivalent to the surface temperature of the sun. The large differences between the temperature calculated assuming an ideal gas with a constant specific heat ratio of 1.4 and the equilibrium temperature calculated using the actual composition can also be observed. The mole fraction equilibrium composition of air at elevated temperatures and at sea level density is shown in Fig. 2. The calculations below 4000 K are the early work of Hirschfelder and Curtiss (1)[3] using the then accepted value for the dissociation energy of nitrogen, 7.37 electron volts per molecule. The calculations above 4000 K by the National Bureau of Standards (2) are carried out using the recently determined value, 9.76 electron volts per molecule (3). The effect of the change in the dissociation energy of nitrogen is evidenced by the change in fraction of atomic nitrogen at 4000 K. The

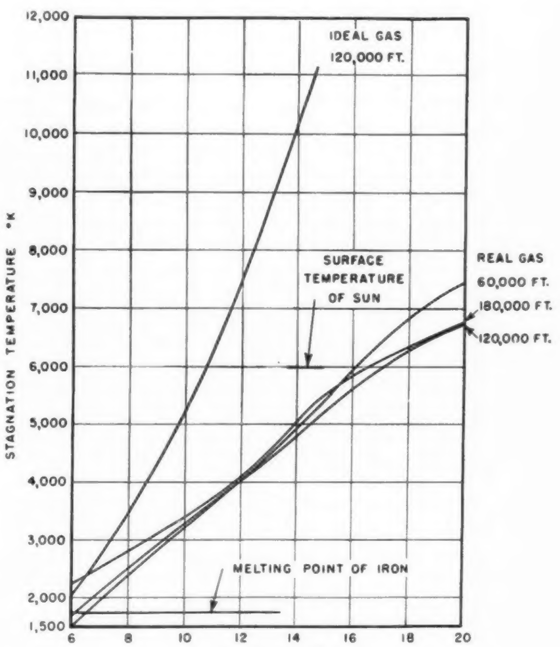


Fig. 1 Maximum temperature at the blunt nose of a perfectly insulated body

Received March 23, 1956.

[1] The work to be described was supported by the Air Force through the Arnold Engineering Development Center; the Aeronautical Research Laboratory, Wright Air Development Center; and the Office of Scientific Research; and represents the contribution of a large number of the personnel in the Aerodynamic Research Department of the Cornell Aeronautical Laboratory.

[2] Head, Gasdynamics Section, Aerodynamic Research Department.

[3] Numbers in parentheses indicate References at end of paper.

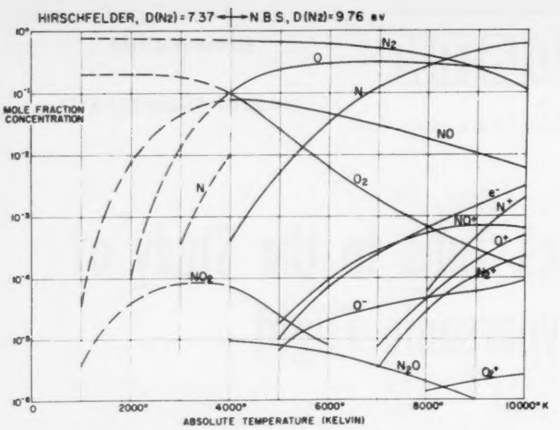


Fig. 2 Mole fraction equilibrium composition of air at elevated temperatures and at sea level density

use of the wrong dissociation energy appreciably affects gas dynamical calculations (18). At 6000 K it may be observed that, in addition to nitrogen and oxygen molecules, the air consists of atomic oxygen, atomic nitrogen, small percentages of the various oxides of nitrogen, electrons, negative oxygen ions, and positive ions of nitric oxide. The major portion of the electrons below about 8000 K arises from the thermal ionization of the small but important concentration of NO. The small quantity of some of the constituents such as electrons, although not of such magnitude to radically alter the thermodynamic properties, may be sufficient to appreciably alter the transport phenomena (heat conduction, viscosity, etc.) at these high temperatures. For example, at a temperature of 4000 K which corresponds to a flight Mach number of 12, the electron concentration behind a normal shock wave is sufficient to produce an electrical conductivity equivalent to that of sea water. It is to be expected that the presence of the free atoms, electrons, and molecules in excited states will also influence flow phenomena such as boundary layer formation as a result of the energy transported by these species existing at the high temperature. The changes in the composition of air at the elevated temperatures of hypersonic flight directly affect not only stagnation temperature, but other aspects of body aerodynamics (4). This is strikingly illustrated by comparison of real and ideal limiting wedge angles for shock wave attachment (Fig. 3).

In the above discussion an equilibrium state was assumed in all calculations. However, this assumption in some of the problems associated with hypersonic flight may be incorrect since the transit time of a particle of gas near the body may be of the same order as the relaxation time. Lack of knowledge of high temperature reaction rate phenomena, molecular, atomic, electronic, and ionic scattering cross-section data or interaction potential data at the present time considerably complicates the problem of determining the nonequilibrium properties of air. Indeed, it is this phase of the problem which vitally requires basic research.

In view of the chemical and physical activity of air encountered in hypersonic flight, it is important that laboratory studies of flow at very high Mach numbers be done in air at the appropriately high temperatures.

In a conventional wind tunnel the stagnation temperature at the test section is approximately equal to the plenum temperature. Therefore heating techniques must be developed which yield flight stagnation temperatures. The modified pebble heater (5) is perhaps the most successful of the direct heating methods. Temperatures of 1800 K, corresponding to a free-flight Mach number of approximately 6, have been achieved. It is also possible to heat air to relatively high stagnation temperatures using various types of electric arcs

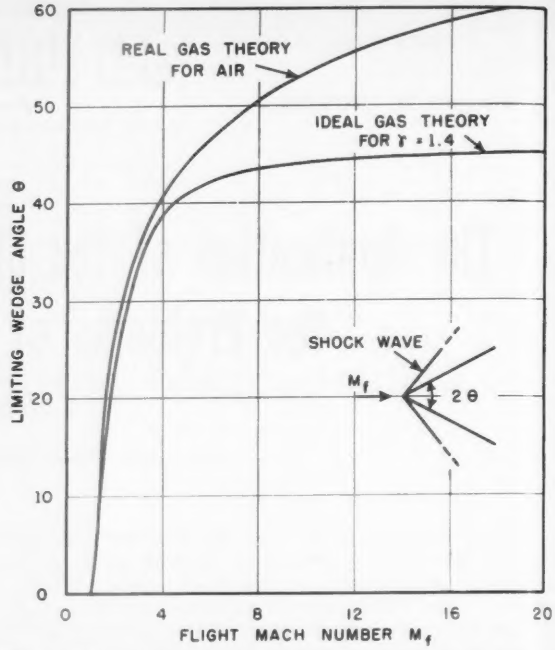


Fig. 3 Limiting wedge angle for shock attachment in air. Curve for air is for ambient pressure of 0.01 atmospheres and ambient temperature of 298 K

(6), and temperatures of about 3600 K have been reported in arcs used to produce nitric oxide from air.

The stagnation temperature in conventional steady flow wind tunnels, however, is limited by the strength at high temperatures of present-day materials. Temperatures required for the simulation of Mach 7 flight are well above the melting points of all known metals. Considerable effort is therefore being devoted to the development of other experimental techniques which circumvent these limitations.

Nonsteady heating methods, such as rapid compression by means of a piston, offer means of reaching high temperatures for brief periods which would not damage the tunnel structure. Another technique for rapid heating, which has in recent years found increasing application, involves the use of strong shock waves; temperatures beyond those encountered in flight may be generated with relatively simple shock tube equipment (7). One of the chief attributes of the shock tube as a generator of hot gases is the relative precision with which the state of the test gas is known, assuming that the thermodynamic equilibrium is attained and that the shock Mach number can be adequately measured. This paper describes the use of a shock tube for the study of high stagnation temperature flows and high Mach number flows in air. In addition, the application of shock tube techniques at Cornell Aeronautical Laboratory to other areas of high temperature research is outlined.

The Conventional Shock Tube

Before describing the specific modifications of the shock tube required to generate hypersonic flow, it may be appropriate to review briefly the phenomena that occur in a conventional shock tube and describe its potentialities as a laboratory instrument for the investigation of high temperature problems. The conventional shock tube consists of a constant-area duct separated by a thin diaphragm into regions of high and low pressure. When the diaphragm is ruptured, a shock wave is generated which propagates through the low pressure gas, accelerating the gas and simultaneously raising its temperature. If the shock wave propagates

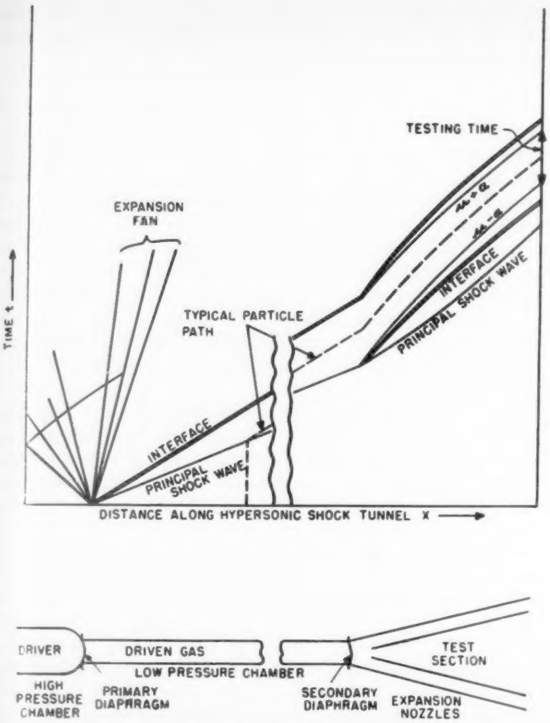


Fig. 4 Wave diagram for a shock tube nozzle configuration

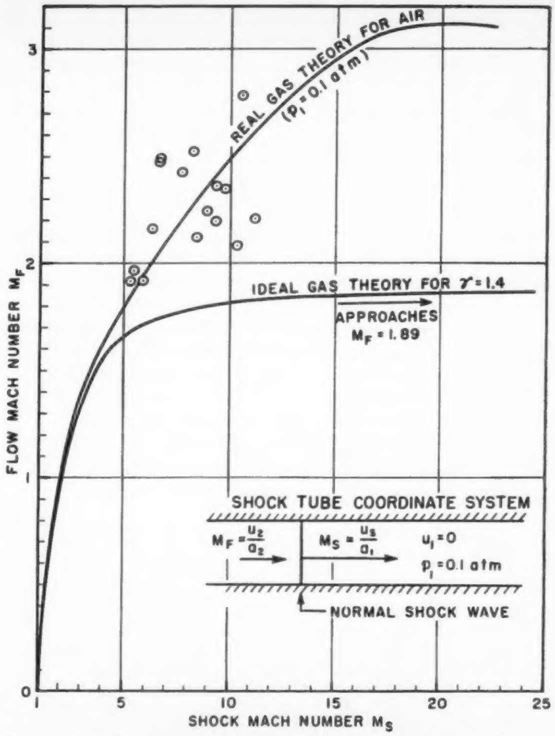


Fig. 5 Flow Mach number obtainable in a straight shock tube

through the tube without attenuation due to viscous losses or other causes, then the gas between the interface (which ideally is a plane separating the gas of the driver section and the gas in the low pressure section) and the shock is then at a uniform temperature and velocity. At any point in the shock tube the flow useful for testing is that between the shock wave and the interface. The essential features of the flow in the shock tube can be observed in the wave diagram of Fig. 4.

Although supersonic flow Mach numbers can be achieved in a straight shock tube behind the normal shock wave, the flow Mach number attainable behind a very strong shock wave is limited. Although an extremely high velocity can be generated behind a normal shock in a constant area duct by using a large initial pressure ratio, the ambient temperature behind the shock is correspondingly high. This consideration yields a maximum Mach number of 1.89 for an ideal diatomic gas (8). Fig. 5 shows the observed variation with shock Mach number of the flow Mach number behind a normal shock moving into still air. The points shown in the diagram are measured flow Mach number values in a straight shock tube. Since the excitation of the higher vibrational states of the molecules and dissociation absorb considerable amounts of the available energy, the static temperature behind the normal shock does not rise so rapidly as if the gas were ideal. Consequently, the flow Mach number behind the normal shock in air is higher.

Fig. 6 is a schlieren photograph of flow phenomena in a straight shock tube with the normal shock wave moving from left to right into still air. For the measured shock Mach number of 9 in this figure, the temperature behind the shock wave is about 4000 K. The flow Mach number may be determined from the measurements of the Mach angle of the disturbance waves which can be seen behind the shock. The shaded region behind the normal shock is due to a relaxation time to equilibrium flow of approximately 10 microsec. The straight shock tube studies described are a part of the investigations being conducted at Cornell Aeronautical Laboratory of the equilibrium and nonequilibrium phenomena behind strong normal shock waves.

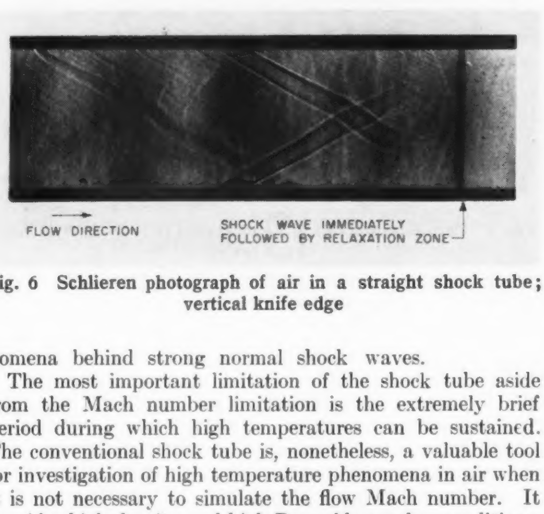


Fig. 6 Schlieren photograph of air in a straight shock tube; vertical knife edge

The most important limitation of the shock tube aside from the Mach number limitation is the extremely brief period during which high temperatures can be sustained. The conventional shock tube is, nonetheless, a valuable tool for investigation of high temperature phenomena in air when it is not necessary to simulate the flow Mach number. It provides high density and high Reynolds number conditions.

In order to generate strong shock waves, the practice at Cornell Aeronautical Laboratory has been to generate the initial high pressures required behind the diaphragm by combustion of gaseous mixtures of oxygen, hydrogen, and a diluent. In early investigations, diaphragm strengths were chosen so that the diaphragm would be ruptured prior to achievement of constant volume combustion pressures (9), with the expectation that the final stages of combustion would take place at constant pressure. While strong shock waves in high density gas were achieved by this "constant pressure" drive, measurements of the shock velocity and pressure in the flow behind the shock wave indicated that irregularities in the combustion process could result in appreciable shock wave attenuation. Expansion waves generated in the heating zone during combustion could overtake and weaken the normal shock. The most serious con-

sequence of this attenuation is the resultant change in the flow parameters behind the shock. Under these circumstances a steady flow condition is not achieved in the shock tube. Nevertheless, from the shock velocity record or the measure pressure history of the flow, the actual variation of flow conditions with time can be calculated by means of the techniques of the method of characteristics (10).

The Hypersonic Shock Tunnel

The chief limitation of aerodynamic testing in the conventional shock tube is the flow Mach number limitation previously discussed. Higher flow Mach numbers can be achieved by modifications of a conventional shock tube (8). For example, if a conventional shock tube is terminated by a supersonic nozzle (11) as indicated schematically in Fig. 4, the steady supersonic flow behind the shock wave expands through this nozzle and the flow Mach number can thus be raised to the desired test Mach number. By controlling the strength of the primary shock and employing the proper nozzle configuration, the stagnation temperature and Mach number conditions of free flight can be duplicated.

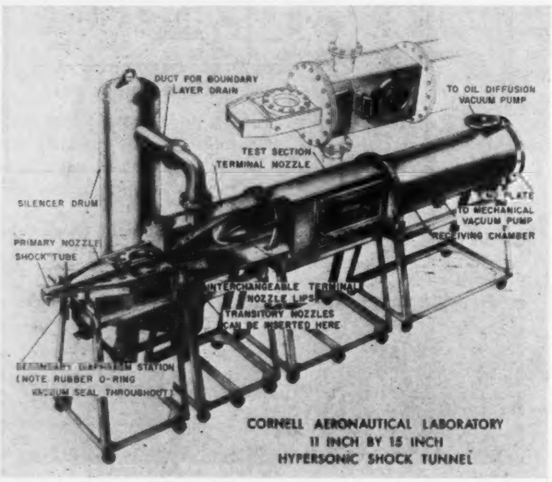


Fig. 7 Cornell Aeronautical Laboratory 11- × 15-in. hypersonic shock tunnel

Fig. 7 is a drawing of the 11- × 15-in. hypersonic tunnel at Cornell Aeronautical Laboratory which is being employed for hypersonic testing at the present time. The flow expansion occurs through a two-step nozzle and the boundary layer generated along the walls of the shock tube and the primary nozzle is removed at the beginning of the second step. The test section indicated by the location of the cone model is 11 × 15 in. and is equipped with 10-in.-diam observation windows. The rectangular section with the window may also be used as a test station.

In the design of a hypersonic nozzle, real gas calculations must be used since the expansion ratio required to achieve a given test Mach number is appreciably altered (4). The nozzle expansion ratio is greatly increased in comparison to the value required to produce the same flow Mach number assuming an ideal gas with a specific heat ratio of 1.4. The Reynolds number per foot in the test section is correspondingly reduced in comparison to the ideal gas values. As an indication of the extent of these effects, at a flow Mach number of 10, the expansion ratio is increased and the Reynolds number per foot decreased by a factor of 10. The effect on testing time is also of some importance since the flow duration in any reasonable length of tube is of the order of milliseconds. When real gas properties are considered, the testing time is reduced by a factor of 2 at high Mach numbers as compared with the testing time calculated on an ideal gas basis. For a given shock strength in the real gas, the flow velocity is greater than in the ideal gas and, consequently, all the useful flow passes a given point in the shock tube in a shorter time.

At the end of the low-pressure section it is necessary to insert a secondary diaphragm. This diaphragm is required in order that the nozzle section may be evacuated to enable rapid establishment of the high Mach number flows. When the shock propagates into the nozzle, disturbances are generated which tend to move upstream against the flow, and reduce the available testing time. By properly selecting the initial pressure in the nozzle, only weak disturbances will be generated which will be swept out of the nozzle with the characteristic velocity $(u - a)$ where u is the flow velocity and a is the velocity of sound. This enables the maximum use of the available testing time to be achieved in the hypersonic nozzle. A detailed discussion of these flow-starting phenomena is given in (12).

Fig. 8 shows the experimental variation of the tunnel flow Mach number with time during a run as determined by measurements of the shock angle on a 20 deg wedge. These measured Mach numbers are believed to be accurate to ± 0.2 of a Mach number. The initial time indicated here is the time at which the shock wave first crosses the wedge. It may be interesting to note that, prior to the establishment of steady flow, a very high Mach number is obtained in the test flow as predicted by theoretical calculations of the starting phenomena.

When the waves generated in the starting process are swept downstream, a period of steady flow of approximately one millisecond duration is established as indicated in Figs. 8 and 9. Mach number measurements obtained from records, as in Fig. 9, show that, within measurement errors

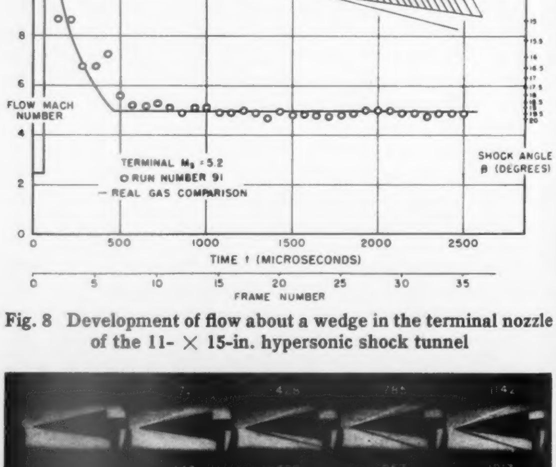


Fig. 8 Development of flow about a wedge in the terminal nozzle of the 11- × 15-in. hypersonic shock tunnel

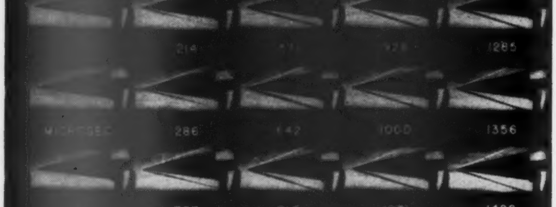


Fig. 9 20° wedge in 11- × 15-in. hypersonic shock tunnel; run 35

of the shock angle, the flow Mach number may be considered constant during the testing time.

Although the flow Mach number has been observed to be relatively constant in the test section, it is possible for the test section density and pressure to vary considerably if large shock attenuation occurs in the constant area low pressure section. As previously described, the expansion waves which cause the shock attenuation also produce a changing condition in the flow behind the shock wave. This flow attenuation appears primarily as a continuous change in pressure and density of the flow entering the nozzle, resulting in a varying pressure and density at the test model. The variation in density and pressure in the test section cannot be observed from measurements of flow Mach number alone.

No satisfactory instrumentation is presently available for the measurement of the low density and pressure established in the test section. This is one of the chief limitations of testing in the hypersonic shock tunnel. However, it has been found possible to calculate the tunnel flow conditions from careful measurements of the shock Mach number and the pressure history of the flow behind the normal shock in the low pressure section and from measurements of the flow Mach number in the test section. The theoretical calculations are carried out using the method of characteristics (10).

At the present time, the driver technique is being modified to permit the attainment of constant volume combustion pressure. Fig. 10 shows the calculated densities which can be produced in the hypersonic shock tunnel using the "constant volume" combustion of a mixture of 81 per cent helium and 19 per cent stoichiometric oxygen and hydrogen. This driver has a greater acoustic velocity than any mixture of stoichiometric oxygen and hydrogen with excess hydrogen.

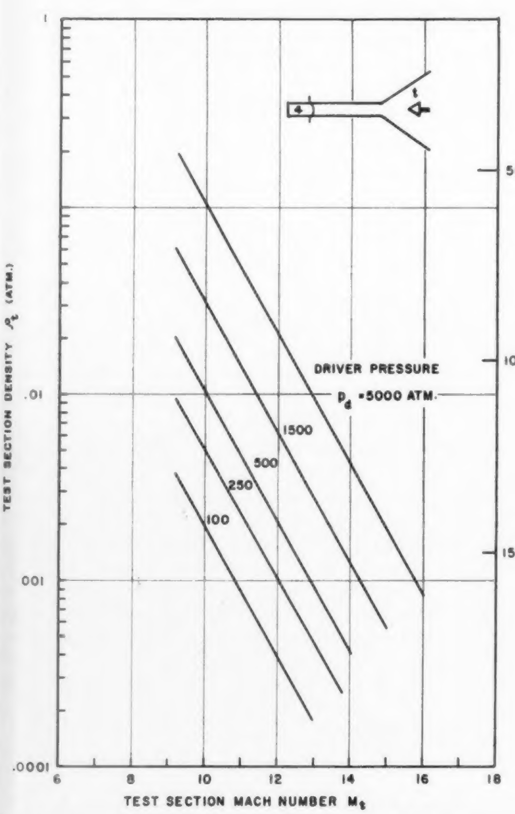


Fig. 10 Density in the test section for several driver pressures established by combustion at constant volume of a mixture of 81% helium and 19% stoichiometric oxygen and hydrogen $\gamma = 1.45$

It is anticipated that the constant volume process will yield less shock attenuation than is observed with the "constant pressure" process.

Methods of Heat Transfer Measurement in the Hypersonic Shock Tunnel

Because of the importance of knowledge of the heat transfer rates in high velocity flight, the first series of measurements that have been carried out in the hypersonic shock tunnel have been measurements of heat transfer rates on models mounted in the nozzle. Since the available testing time in the hypersonic shock tunnel is on the order of one millisecond, and the density is low, conventional heat transfer rate instrumentation cannot be used and special techniques have been developed.

The maximum temperature rise on models fabricated from insulating materials and mounted in a shock tunnel is about 100 K during the brief testing time. By measuring the time history of the surface temperature during this interval, the heat transfer rate at the surface can be determined by calculation.

In shock tunnel applications the temperature rise is measured by a thin metallic film on the order of one micron in thickness bonded to the surface of the model. If this film is one micron thick or less, the temperature of the film will correspond to that of the surface with a lag which may be considered small as compared to the testing time. The temperature rise in the film is measured by observing the change in its electrical resistance. Indeed, the rise time of these gages is so fast that the gages have been successfully used as shock wave detectors for the purpose of measuring shock velocity (13). Gages of this type have also been used to measure heat transfer rates to the walls of the shock tube (14). Basically, the technique employed is a modification of the evaporated film thermocouple which has been developed in recent years for the measurement of transient temperatures in gun barrels (15).

At Cornell Aeronautical Laboratory, a simple and effective thin film gage has been developed by painting a suspension of silver and platinum on glass or quartz test models which are then baked at approximately 1100 F for 20 min (16). Measurements of the thickness of such gages have indicated that they are of a uniform thickness of about one micron. At the present time at Cornell Aeronautical Laboratory, gages

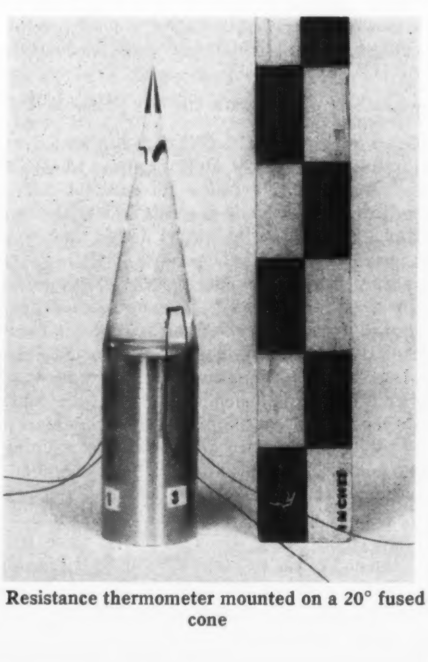


Fig. 11 Resistance thermometer mounted on a 20° fused quartz cone

of this type are being used in a variety of heat transfer programs carried out in the hypersonic shock tunnel.

The performance of these gages prior to their application to the hypersonic range has been verified by tests in a straight shock tube under subsonic flow conditions. In these tests the flow conditions about the model were such that the heat transfer rate could be easily calculated, and the time scale of the measurement was similar to that obtained in the hypersonic shock tunnel. Heat transfer records both at the stagnation point of blunt bodies and on flat plate airfoils placed in the center of the shock tube were taken. In all cases the agreement between the calculated temperature rise and the temperature rise measured by the gage has been excellent. Fig. 12 is a record obtained on a flat plate airfoil on which a suddenly generated Mach 0.3 flow was obtained in a shock tube. The dotted line is the calculated theoretical temperature rise under these operating conditions, and the heavy solid line is the oscilloscope trace. The falloff at 4 millisec is not due to the gage but shows the arrival of secondary waves which change the flow conditions.

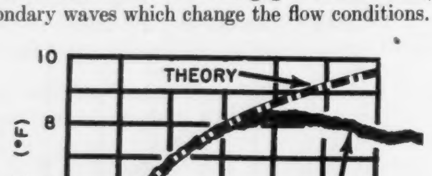


Fig. 12 Response of a resistance thermometer to a temperature step of 200 F with the theoretical response superimposed

Also, at the present time techniques of instrumentation of other aerodynamic parameters, such as force and pressure measurements, are being explored. The preliminary results of this program have indicated that the measurement of model forces by means of a special balance system is possible within the available testing time of the hypersonic shock tunnel.

Special Applications of the Shock Tube

As pointed out in the introduction, information about the nonequilibrium properties of air is required for the study of hypersonic flight. While much information may be obtained from the conventional shock tube and the hypersonic shock tunnel, shock tubes of special design may be required for some phases.

For example, a special modification of the shock tube may be employed to investigate high temperature chemical reactions, especially those which occur in high temperature air. Fig. 13 shows the modification of the conventional shock tube employed at Cornell Aeronautical Laboratory to study chemical kinetics (17). This "chemical" shock tube consists of a central driver section containing inert gas at high pressure, separated by diaphragms from the section containing the reactant gas and a large evacuated damping chamber. When the diaphragm between the driver gas and the reactant is ruptured, a shock wave travels through the reactant mixture heating and compressing it. This shock wave is then reflected at the end of the reactant section, further compressing and heating the reactant gas to the final reaction conditions. The rapid travel of the reflected shock wave through the reactant gas establishes a uniform condition of pressure and temperature for times on the order of several milliseconds. At a predetermined time, the diaphragm separating the driver from the evacuated chamber is burst. The expansion fan generated by the sudden flow of driver gas into the vacuum chamber propagates down the shock tube through the reacting mixture, cooling and expanding the reacting gas. In the chemical shock tube at Cornell Aeronautical Laboratory it is estimated that cooling rates on the order of five hundred thousand degrees Kelvin per second are obtained. In addition, the large evacuated tank acts as a damper, preventing waves from reflecting back into the reaction zone so that the reactant mixture is subjected to a single temperature pulse.

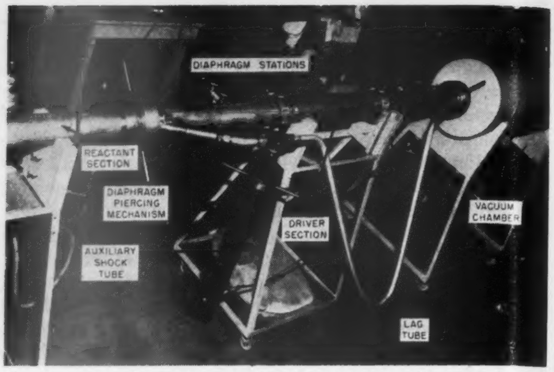


Fig. 13 Cornell Aeronautical Laboratory chemical shock tube

The first reaction to be studied in the chemical shock tube was the fixation of atmospheric nitrogen. Fig. 14 shows the results of some recent measurements of nitric oxide formation from air. It may be observed that equilibrium amounts of nitric oxide were not achieved in the low temperature region of the curve because the reaction rates and heating times are small. At higher temperatures, the reaction rates are large, and equilibrium amounts of nitric oxide were formed during the short heating times. Nevertheless, some of the nitric oxide decomposes during the cooling phase of the pulse since the cooling rates are inadequate to "freeze" the high temperature equilibrium. From a study of the approach to equilibrium, it is possible to determine the kinetics of the reaction.

One technique that has been employed in the chemical shock tube which may be of significance for other shock tube studies is the use of a "tailored interface." By adjusting the composition of the driver and the reactant gases, the shock reflected from the closed end of the tube will be transmitted without reflection through the interface. Since no reflection from the interface occurs, a constant pressure and temperature condition can be maintained in the reaction zone for a relatively long period of time (8).

The tailored interface technique may be used for aerodynamic testing since it may enable longer testing times

(*Continued on page 568*)

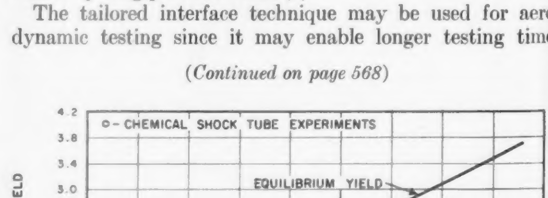


Fig. 14 Yield of nitric oxide from air at elevated temperatures

Transfer Between Circular Orbits

D. F. LAWDEN[1]

Canterbury University College, Christchurch, New Zealand

A solution is given to the problem of transferring a rocket from a circular orbit about one planet into another about a second planet with minimum expenditure of fuel. The planetary orbits are assumed to be coplanar and the longitudes of the planets in their orbits at the instants of departure and arrival of the rocket are supposed to be specified. The case of transfer between the Earth and Mars is taken as a numerical example of the general theory.

1 The Problem

A METHOD of calculating the orbit along which a rocket may be transferred from a circular orbit about one planet into another about a second planet with a minimum fuel expenditure has been described in another paper (1).[2] In addition to specifying the optimal trajectory of transfer, the method also determines the most favorable positions of the planets in their orbits about the Sun at the instant of departure. It may be necessary to delay departure for some considerable time until these favorable positions are attained by both planets. If, however, such a delay is not acceptable, the problem arises of calculating the most satisfactory mode of transfer when the two planets are in given relative positions on the chosen date of departure. This is the problem we shall solve in this paper.

2 Solution to the Problem

We shall restrict ourselves to the two-dimensional problem of transfer between two planets moving in coplanar elliptical orbits about the Sun. Ox, Oy are fixed rectangular Cartesian axes in the plane of the orbits. The method may be generalized to deal with the realistic three-dimensional problem by introducing into the argument a third axis Oz. However, the principles upon which the solution to this more complex problem is based will be identical in character with those which lead to a solution of the more elementary one, and no advantage will be gained, therefore, at this stage, by further complicating the analysis in order to achieve complete generality. Again, absolute accuracy could only be achieved by taking into account the perturbations caused in the planets' motions by their mutual attraction and the attractions of other bodies of the solar system, but the saving in fuel which would result would be negligible by comparison with the inevitable losses which will have to be accepted on account of our inability to navigate the rocket along any prescribed track without error. The most satisfactory procedure will always be to disregard all such small effects when computing an optimal track and then to allow for these, and earlier errors of navigation, during passage, by small correctional thrusts from the motor applied at various check points along the transfer orbit. A method of computing such corrections has been outlined in (2).

As in (1), we shall suppose that the rocket escapes from its circular orbit about the planet of departure by means of an impulsive thrust from its motor directed along the tangent to this orbit. It then recedes along a hyperbolic trajectory, merging imperceptibly with the elliptical orbit of transfer in which it moves under the influence of the Sun alone. Coming under the influence of the planet of arrival, it falls along a hyperbolic track whose apse is at the level of the circular orbit. Upon arrival at the apse, it is transferred into the circular orbit by means of a second impulsive thrust in a direction opposing its motion, i.e., tangential to the circular orbit. Thus, apart from two short periods of thrust, the motor is inoperative.

If $(-f, -g)$ represent the x and y components of the gravitational field intensity acting upon the rocket when at the point (x, y) at time t, both f and g will be functions of the variables (x, y, t). Let $x = X(t)$, $y = Y(t)$ be the equations defining the optimal trajectory of the rocket. Along this trajectory, we define a vector called *the primer* having components (u, v) satisfying the equations

$$\left.\begin{aligned} \ddot{u} + u\frac{\partial f}{\partial X} + v\frac{\partial g}{\partial X} &= 0 \\ \ddot{v} + u\frac{\partial f}{\partial Y} + v\frac{\partial g}{\partial Y} &= 0 \end{aligned}\right\} \qquad [1]$$

It is shown in (1) and (3) that over an absolute optimal track, all motor thrusts must be impulsive in character and, in addition, the following conditions must be satisfied:

(a) $u^2 + v^2 \leq 1$ at all points.

(b) (u, v) are the direction cosines of the direction of thrust at each junction at which the motor operates.

(c) $(\dot{u}, \dot{v})$ are continuous over such a junction.

(d) $A = uf + vg + \dot{X}\dot{u} + \dot{Y}\dot{v}$ is continuous across a junction.

(e) $A = 0$ over that section of the orbit of transfer where the attraction of the planets is negligible.

The above conditions were obtained on the assumption that we were free to choose the junctions at which impulsive thrusts were to be generated to suit ourselves. In the case under consideration, this is not so, and a reconsideration of the argument of (3) will show that, if the position of any junction is fixed at the outset, condition (c) may be waived at this junction. We shall not, therefore, require this condition to be satisfied at either of the junctions of the present problem.

Over the hyperbolic trajectory of departure from the initial circular orbit, we shall neglect the effect of the Sun's attraction. Let μ_0/r_0^2 be the attraction per unit mass of the planet of departure at a distance r_0 from its center. Let (e_0, l_0) be the eccentricity and semi-latus rectum, respectively, of the hyperbolic orbit. Its polar equation is then

$$\frac{l_0}{r_0} = 1 + e_0 \cos \psi_0 \qquad [2]$$

where ψ_0 is measured from the apse. If (U_0, V_0) are the components of the primer in the directions of the radius vector r_0 and of the perpendicular to it, respectively, it is proved in (4) that the appropriate solution of Equations [1] is

$$U_0 = P_0 \cos \psi_0 + (Q_0 + H_0 l_0) e_0 \sin \psi_0 \qquad [3]$$

Presented at the ARS 25th Anniversary Annual Meeting, Nov. 14–18, 1955, Chicago, Ill.

[1] Professor of Mathematics. Member of the British Interplanetary Society.

[2] Numbers in parentheses indicate References at end of paper.

$$V_0 = -P_0 \sin \psi_0 + (Q_0 + H_0 I_0)(1 + e_0 \cos \psi_0) + \frac{R_0 - P_0 \sin \psi_0 + H_0 \cot \psi_0}{1 + e_0 \cos \psi_0} \quad [4]$$

where P_0, Q_0, R_0, H_0 are dimensionless constants of integration and

$$I_0 = \frac{1}{2(e_0 - 1)^2} \tan {}^1/_2\psi_0 - \frac{1}{2(e_0 + 1)^2} \cot {}^1/_2 \psi_0 - \frac{6e_0^2}{(e_0^2 - 1)^{5/2}} \tanh^{-1}\left(\sqrt{\frac{e_0 - 1}{e_0 + 1}} \tan {}^1/_2 \psi_0\right) + \frac{e_0^3}{(e_0^2 - 1)^2} \cdot \frac{\sin \psi_0}{1 + e_0 \cos \psi_0} \quad [5]$$

An impulsive thrust is applied at the apse in a direction at right angles to the radius vector. Hence, by condition (b) above, we must have $U_0 = 0$, $V_0 = 1$ at $\psi_0 = 0$. This leads to the conditions

$$P_0 - \frac{e_0}{(e_0 + 1)^2} H_0 = 0 \quad [6]$$

$$Q_0(1 + e_0) + \frac{R_0}{1 + e_0} = 1 \quad [7]$$

It should be noted that $\psi_0 = 0$ makes the expression for I_0 indeterminate. We must accordingly let $\psi_0 \to 0$ in Equation [5].

Let μ/r^2 be the attraction per unit mass of the Sun at a distance r from its center. Let the polar equation of the transfer trajectory, over which the attractions of the planets are negligible, be

$$\frac{l}{r} = 1 + e \cos \psi \quad [8]$$

where ψ is measured from perihelion. If (U, V) are the components of the primer in directions along and perpendicular to r, respectively, then, as shown in (4), since $A = 0$ (condition (e))

$$U = P \cos \psi + Qe \sin \psi \quad [9]$$

$$V = -P \sin \psi + Q(1 + e \cos \psi) + \frac{R - P \sin \psi}{1 + e \cos \psi} \quad [10]$$

where P, Q, R are constants of integration to be determined later. These equations must be identical with Equations [3] and [4] where the hyperbolic trajectory merges with the transfer orbit. The primer components being solutions of second order differential Equations [1], we can ensure this by equating the values of U_0, V_0 and their first derivatives obtained from Equations [3] and [4] with the corresponding quantities obtained from Equations [9] and [10].

If ϕ_0 is the angle made by the direction of the asymptote of the hyperbolic trajectory of departure with the perpendicular to the radius vector r drawn in the sense of ψ increasing, it is shown in (1) that the components of the time derivative of the primer vector as computed from Equations [9] and [10] are

$$(S \sin \phi_0 + T \cos \phi_0)\dot\psi \quad \text{along the asymptote} \quad [11]$$

$$(-S \cos \phi_0 + T \sin \phi_0)\dot\psi \quad \text{perpendicular to the asymptote} \quad [12]$$

where

$$S = \frac{P \sin \psi - R}{1 + e \cos \psi} - Q \quad [13]$$

$$T = \frac{Re \sin \psi - Pe - P \cos \psi}{(1 + e \cos \psi)^2} \quad [14]$$

Consider now the form taken by Equations [3] and [4] at a great distance along the asymptote of the hyperbolic orbit. At such a point, $r_0 \to \infty$ and hence $\cos \psi_0 = -1/e_0$ and $\sin \psi_0 = (e_0^2 - 1)^{1/2}/e_0$. Thus ψ_0 does not vary with t and hence

$$\dot U_0 = H_0 \dot I_0 e_0 \sin \psi_0 = H_0(e_0^2 - 1)^{1/2}\dot I_0 \quad [15]$$

The first two terms in expression [5] for I_0 are constant and hence make no contribution to $\dot I_0$. The last two terms become larger however, and hence must be dealt with separately. Differentiating these two terms with respect to t, we obtain

$$\frac{e_0^2(e_0^2 - 3 - 2e_0 \cos \psi_0)}{(e_0^2 - 1)^2(1 + e_0 \cos \psi_0)^2} \dot\psi_0 \quad [16]$$

Since $\cos \psi_0 = -1/e_0$, and in view of Equation [2], this may be written

$$\frac{e_0^2}{(e_0^2 - 1)l_0^2} r_0^2 \dot\psi_0 \quad [17]$$

But $r_0^2 \dot\psi_0$ is the constant velocity moment of the rocket about the center of attraction and is accordingly equal to $(\mu_0 l_0)^{1/2}$. Thus

$$\dot I_0 = \frac{e_0^2 \mu_0^{1/2}}{(e_0^2 - 1)l_0^{3/2}} \quad [18]$$

It now follows that, at a great distance from the planet of departure

$$\dot U_0 = H_0 e_0^2 \sqrt{\frac{\mu_0}{(e_0^2 - 1)l_0^3}} \quad [19]$$

Now consider Equation [4]. It may be shown that as $\cos \psi \to -1/e_0$, $I_0(1 + e_0 \cos \psi_0) \to$ a constant. It follows that the only term which makes a nonzero contribution to $\dot V_0$ when r_0 is large is

$$\frac{R_0 - P_0 \sin \psi_0 + H_0 \cot \psi_0}{1 + e_0 \cos \psi_0} \quad [20]$$

Referring to Equation [2], we see that this may be written in the form

$$\frac{1}{l_0}(R_0 - P_0 \sin \psi_0 + H_0 \cot \psi_0) r_0 = \frac{1}{l_0}\left[R_0 - P_0 \frac{(e_0^2 - 1)^{1/2}}{e_0} - H_0 \frac{1}{(e_0^2 - 1)^{1/2}}\right] r_0 \quad [21]$$

when $\psi_0 = \cos^{-1}(-1/e_0)$. Differentiating with respect to the time, we obtain

$$\dot V_0 = \frac{1}{l_0}\left[R_0 - P_0 \frac{(e_0^2 - 1)^{1/2}}{e_0} - H_0 \frac{1}{(e_0^2 - 1)^{1/2}}\right] \dot r_0 \quad [22]$$

But $\dot r_0$ is the velocity of recession from the planet of departure. Hence

$$\dot r_0 = [\mu_0(e_0^2 - 1)/l_0]^{1/2}$$

and

$$\dot V_0 = \frac{\mu_0^{1/2}}{l_0^{3/2}}\left[R_0(e_0^2 - 1)^{1/2} - P_0 \frac{e_0^2 - 1}{e_0} - H_0\right] \quad [23]$$

Equations [19] and [23] give the components of the time derivative of the primer along and perpendicular to the asymptote of the hyperbolic orbit when the rocket has receded to a great distance from the planet of departure. Equating these quantities with the corresponding components given at [11] and [12], we obtain the equations

$$(S \sin \phi_0 + T \cos \phi_0) \frac{\dot\psi l_0^{3/2}}{\mu_0^{1/2}} = \frac{H_0 e_0^2}{(e_0^2 - 1)^{1/2}} \quad [24]$$

$$(-S \cos \phi_0 + T \sin \phi_0) \frac{\dot\psi l_0^{3/2}}{\mu_0^{1/2}} = R_0(e_0^2 - 1)^{1/2} - P_0 \frac{e_0^2 - 1}{e_0} - H_0 \quad [25]$$

But $\mu_0,^{1/2}/l_0^{3/2} = (e_0 + 1)^{-3/2} \times$ angular velocity of the rocket in the circular orbit about the planet of departure and hence is large by comparison with $\dot{\psi}$, the angular velocity of the rocket about the Sun at the commencement of the transfer orbit. We shall accordingly approximate Equations [24] and [25] by the equations

$$\frac{H_0 e_0^2}{(e_0^2 - 1)^{1/2}} = R_0(e_0^2 - 1)^{1/2} - P_0 \frac{e_0^2 - 1}{e_0} - H_0 = 0 \quad [26]$$

Solving these latter equations in conjunction with Equations [6] and [7], we obtain

$$P_0 = R_0 = H_0 = 0 \qquad Q_0 = \frac{1}{1 + e_0} \quad [27]$$

Thus, from Equations [3] and [4], at a great distance from the planet of departure

$$U_0 = \sqrt{\frac{e_0 - 1}{e_0 + 1}} \qquad V_0 = 0 \quad [28]$$

This implies that the components of the primer, along and perpendicular to the radius vector r from the Sun, at the commencement of the trajectory of transfer are

$$U = \sqrt{\frac{e_0 - 1}{e_0 + 1}} \sin \phi_0 \qquad V = \sqrt{\frac{e_0 - 1}{e_0 + 1}} \cos \phi_0 \quad [29]$$

Identical results must be given by Equations [9] and [10] and thus

$$P \cos \psi + Qe \sin \psi = \sqrt{\frac{e_0 - 1}{e_0 + 1}} \sin \phi_0 \quad [30]$$

$$-P \sin \psi + Q(1 + e \cos \psi) + \frac{R - P \sin \psi}{1 + e \cos \psi} = \sqrt{\frac{e_0 - 1}{e_0 + 1}} \cos \phi_0 \quad [31]$$

where ψ takes the value appropriate to the commencement of the orbit of transfer.

The transition from the transfer orbit into the hyperbolic orbit of approach is dealt with similarly and yields the conditions

$$P \cos \psi' + Qe \sin \psi' = \sqrt{\frac{e_1 - 1}{e_1 + 1}} \sin \phi_1 \quad [32]$$

$$-P \sin \psi' + Q(1 + e \cos \psi') + \frac{R - P \sin \psi'}{1 + e \cos \psi'} = \sqrt{\frac{e_1 - 1}{e_1 + 1}} \cos \phi_1 \quad [33]$$

ψ' being the value of ψ appropriate to the end of the transfer orbit, ϕ_1 being the angle made by the asymptote of the approach orbit with the perpendicular to the radius vector r, and e_1 being the eccentricity of the hyperbola of approach.

Condition (d), above, may be applied at each junction, but yields equations involving the constants of integration which appear when Equations [1] are integrated over the circular orbits about the planets. Such equations do not limit the trajectory of transfer in any way, but only serve to fix the new constants of integration.

Elimination of the quantities P, Q, R between Equations [30] to [33] now yields the condition to be satisfied by the optimal transfer orbit, viz.

$$\begin{aligned} &E_0 \sin \phi_0 \, [(2 + e \cos \psi) \cos (\psi - \psi') - (2 + e \cos \psi')] \\ &+ E_1 \sin \phi_1 [(2 + e \cos \psi') \cos (\psi - \psi') - (2 + e \cos \psi)] \\ &+ [E_0(1 + e \cos \psi) \cos \phi_0 - E_1(1 + e \cos \psi') \cos \phi_1] \times \\ &\qquad \sin (\psi' - \psi) = 0 \quad [34] \end{aligned}$$

where

$$E_0 = \sqrt{\frac{e_0 - 1}{e_0 + 1}} \qquad E_1 = \sqrt{\frac{e_1 - 1}{e_1 + 1}} \quad [35]$$

Let (r_0, r_1) be the respective distances of the planets of departure and arrival from the Sun at the times of departure or arrival of the rocket, and let (θ_0, θ_1) be the respective longitudes of the planets at these instants. If γ is the longitude of perihelion on the transfer orbit, it then follows that at the terminals of the transfer orbit

$$\psi = \theta_0 - \gamma, \qquad \psi' = \theta_1 - \gamma \quad [36]$$

and hence, from Equation [8], that

$$\frac{l}{r_0} = 1 + e \cos (\theta_0 - \gamma) \quad [37]$$

$$\frac{l}{r_1} = 1 + e \cos (\theta_1 - \gamma) \quad [38]$$

These latter equations permit us to write the condition [34] in the form

$$\frac{E_1}{E_0} = \frac{\dfrac{l}{r_0} \sin (\theta_1 - \theta_0) \cos \phi_0 + \left[\left(1 + \dfrac{l}{r_0}\right) \cos (\theta_1 - \theta_0) - \left(1 + \dfrac{l}{r_1}\right)\right] \sin \phi_0}{\dfrac{l}{r_1} \sin (\theta_1 - \theta_0) \cos \phi_1 - \left[\left(1 + \dfrac{l}{r_1}\right) \cos (\theta_1 - \theta_0) - \left(1 + \dfrac{l}{r_0}\right)\right] \sin \phi_1} \quad [39]$$

If w_0 is the velocity of the rocket in its circular orbit about the planet of departure and relative to this body, its velocity at infinity on the hyperbolic orbit along which it leaves the planet is $w_0(e_0 - 1)^{1/2}$. This velocity must equal the vector difference between the velocity of the planet in its orbit at the time of departure and the velocity of the rocket relative to the Sun at the commencement of the transfer orbit. If λ_0 is the semi-latus rectum, ϵ_0 is the eccentricity, and γ_0 is the longitude of perihelion of the orbit of the planet of departure, it may be shown (5) that this leads to the conditions

$$w_0(e_0 - 1)^{1/2} \cos \phi_0 = \mu^{1/2} (l^{1/2} - \lambda_0^{1/2})/r_0 \quad [40]$$

$$w_0(e_0 - 1)^{1/2} \sin \phi_0 = \mu^{1/2} \left[\frac{e}{l^{1/2}} \sin (\theta_0 - \gamma) - \frac{\epsilon_0}{\lambda_0^{1/2}} \sin (\theta_0 - \gamma_0)\right] \quad [41]$$

Whence, eliminating ϕ_0, we obtain

$$w_0^2 (e_0 - 1) = \mu \left[\frac{e^2}{l} + \frac{\epsilon_0^2}{\lambda_0} - \frac{2e\epsilon_0}{l^{1/2}\lambda_0^{1/2}} \cos (\gamma - \gamma_0) - \left(\frac{1}{l^{1/2}} - \frac{1}{\lambda_0^{1/2}}\right)^2 \left(1 + \frac{2l^{1/2}\lambda_0^{1/}}{r_0}\right)\right] \quad [42]$$

as explained in (5).

The following equations may be found similarly

$$w_1(e_1 - 1)^{1/2} \cos \phi_1 = \mu^{1/2}(\lambda_1^{1/2} - l^{1/2})/r_1 \quad [43]$$

$$w_1(e_1 - 1)^{1/2} \sin \phi_1 = \mu^{1/2} \left[\frac{\epsilon_1}{\lambda_1^{1/2}} \sin (\theta_1 - \gamma_1) - \frac{e}{l^{1/2}} \sin (\theta_1 - \gamma)\right] \quad [44]$$

$$w_1^2 (e_1 - 1) = \mu \left[\frac{e^2}{l} + \frac{\epsilon_1^2}{\lambda_1} - \frac{2e\epsilon_1}{l^{1/2}\lambda^{1/2}} \cos (\gamma - \gamma_1) - \left(\frac{1}{l^{1/2}} - \frac{1}{\lambda_1^{1/2}}\right)^2 \left(1 + \frac{2l^{1/2}\lambda_1^{1/2}}{r_1}\right)_1 \right. \quad [45]$$

Eliminating ϕ_0 and ϕ_1 from the condition [39] by the use

of Equations [40], [41], [43], and [44], we obtain it in the form

$$\sqrt{\frac{w_0^2\,(e_0 + 1)}{w_1^2\,(e_1 + 1)}} = \frac{L_0}{L_1} \quad \text{[46]}$$

where

$$L_0 = \frac{l}{r_0^2}\,(l^{1/2} - \lambda_0^{1/2}) \sin(\theta_1 - \theta_0)$$

$$+ \left[\left(1 + \frac{l}{r_0}\right)\cos(\theta_1 - \theta_0) - \left(1 + \frac{l}{r_1}\right)\right] \times$$

$$\left[\frac{e}{l^{1/2}} \sin(\theta_0 - \gamma) - \frac{\epsilon_0}{\lambda_0^{1/2}} \sin(\theta_0 - \gamma_0)\right]$$

$$L_1 = \frac{l}{r_1^2}\,(\lambda_1^{1/2} - l^{1/2}) \sin(\theta_1 - \theta_0)$$

$$- \left[\left(1 + \frac{l}{r_1}\right)\cos(\theta_1 - \theta_0) - \left(1 + \frac{l}{r_0}\right)\right] \times$$

$$\left[\frac{\epsilon_1}{\lambda_1^{1/2}} \sin(\theta_1 - \gamma_1) - \frac{e}{l^{1/2}} \sin(\theta_1 - \gamma)\right]$$

Equations [37], [38], [42], [45], and [46] determine the five unknowns e_0, e_1, l, e, γ and hence the optimal mode of transfer. These equations are easily reduced to one condition, since Equations [42], [45] may be employed to eliminate e_0 and e_1 from Equation [46] and then, solving Equations [37], [38] for l and e in terms of γ, these quantities also may be eliminated. We are left with a single equation for γ which must be solved numerically.

3 Transfer Between Circular Orbits

The orbits of the principal bodies of the solar system being very nearly circular, the simplified forms taken by the equations of the last section when it is assumed that the orbits of the planets of departure and arrival are exactly circular are of some importance. In this case, $\epsilon_0 = \epsilon_1 = 0$ and λ_0, λ_1 are the radii of the planetary orbits. Also $r_0 = \lambda_0$, $r_1 = \lambda_1$. Thus Equations [42], [45] can now be written

$$w_0^2\,(e_0 - 1) = \mu\left(\frac{e^2 - 1}{l} + \frac{3}{r_0} - \frac{2l^{1/2}}{r_0^{3/2}}\right) \quad \text{[47]}$$

$$w_1^2\,(e_1 - 1) = \mu\left(\frac{e^2 - 1}{l} + \frac{3}{r_1} - \frac{2l^{1/2}}{r_1^{3/2}}\right) \quad \text{[48]}$$

Condition [46] is then equivalent to

$$\sqrt{\frac{e^2 - 1 + \dfrac{3l}{r_0} - 2\left(\dfrac{l}{r_0}\right)^{1/2} + \dfrac{2w_0^2}{\mu}\,l}{e^2 - 1 + \dfrac{3l}{r_1} - 2\left(\dfrac{l}{r_1}\right)^{1/2} + \dfrac{2w_1^2}{\mu}\,l}} = \frac{G_0}{G_1} \quad \text{[49]}$$

where

$$G_0 = \left[\left(\frac{l}{r_0}\right)^2 - \left(\frac{l}{r_0}\right)^{3/2}\right]\sin(\theta_1 - \theta_0) +$$

$$\left[\left(1 + \frac{l}{r_0}\right)\cos(\theta_1 - \theta_0) - 1 - \frac{l}{r_1}\right] e \sin(\theta_0 - \gamma)$$

$$G_1 = \left[\left(\frac{l}{r_1}\right)^2 - \left(\frac{l}{r_1}\right)^{3/2}\right]\sin(\theta_0 - \theta_1) +$$

$$\left[\left(1 + \frac{l}{r_1}\right)\cos(\theta_0 - \theta_1) - 1 - \frac{l}{r_0}\right] e \sin(\theta_1 - \gamma).$$

This latter equation, together with Equations [37] and [38], specify the optimal trajectory.

If the rocket is to be transferred from a circular orbit just outside the Earth's atmosphere into another close to the surface of Mars, the following values must be substituted into Equation [49]

$$r_0 = 1.497 \times 10^{13}, \qquad r_1 = 2.280 \times 10^{13}$$

$$\mu = 1.33 \times 10^{26}, \qquad w_0 = 7.912 \times 10^5,\ w_1 = 3.557 \times 10^5$$

the units being cgs. In this case, we have solved Equation [49] for γ when $(\theta_1 - \theta_0)$ takes the values shown in Table 1. The corresponding values of l and e are also given, together with the net characteristic velocity V (km/sec) of the maneuver and the time of transit T (days). The amount $\Delta\omega$ by which the longitude of Mars exceeds that of the Earth at the instant of departure is shown in the last column.

When $\theta_1 - \theta_0 = 180$ deg, the optimal transfer orbit is tangential to both the planetary orbits. This is the well-known "Hohmann" case and corresponds to an over-all optimum.

For values of $\Delta\omega$ other than those within the range of the table, the characteristic velocity is far too large to be practicable, or more than one complete circuit of the transfer orbit must be made so that the waiting time is greater than that which must elapse to bring Mars into a more favorable position. There will accordingly be periods during which transfer between the Earth and Mars is not practicable. This phenomenon has been discussed by Preston-Thomas (6).

References

1 Lawden, D. F., "Optimal Transfer Between Circular Orbits About Two Planets," *Astronautica Acta*, vol. 1, 1955, pp. 88–89.

2 Lawden, D. F., "Correction of Interplanetary Orbits," *Journal of the British Interplanetary Society*, vol. 13, 1954, pp. 215–223.

3 Lawden, D. F., "Minimal Rocket Trajectories," *Journal of the American Rocket Society*, vol. 23, 1953, pp. 360–367.

4 Lawden, D. F., "Fundamentals of Space Navigation," *Journal of the British Interplanetary Society*, vol. 13, 1954 pp. 87–101.

5 Lawden, D. F., "The Determination of Minimal Orbits," *Journal of the British Interplanetary Society*, vol. 11, 1952, pp. 216–224.

6 Preston-Thomas, H., "Two Aspects of the Time Element in Interplanetary Flight," Proceedings of the Fifth International Astronautical Congress, Innsbruck, 1954, Springer-Verlag, Vienna.

Table 1

$\theta_1 - \theta_0$	γ	l	e	V	T	$\Delta\omega$
45°	−108.5°	1.259×10^{13}	0.5010	18.58	80	3.2°
90°	−62.5°	1.696×10^{13}	0.2889	9.61	136	18.7°
135°	−30°	1.786×10^{13}	0.2241	6.38	198	31.5°
180°	0°	1.807×10^{13}	0.2076	5.75	259	44.4°
225°	30°	1.786×10^{13}	0.2241	6.38	317	58.8°
270°	62.5°	1.696×10^{13}	0.2889	9.61	366	78.2°
315°	108.5°	1.259×10^{13}	0.5010	18.58	354	129.5°

Thermonuclear Power Plants

HSUE-SHEN TSIEN[1]

Daniel and Florence Guggenheim Jet Propulsion Center, California Institute of Technology, Pasadena, Calif.

Some of the unique features of thermonuclear power plants and the essential problems in the technical design of such plants are discussed in this paper. The thermonuclear reaction rate for the fusion of deuterium is calculated on the basis of a similar analysis published by Gamow and Teller. The pressure, temperature, and minimum dimensions of the necessary reaction chamber are determined largely by consideration of reaction quenching and energy loss near the walls. Results are presented for the power output and the efficiency of a power station utilizing the deuterium fusion reaction. The comment by Greenstein that follows this paper deals particularly with the difficult problem of calculating the reaction quenching and energy loss rates at the walls.

1 Introduction

A GREAT majority of the present discussions and plans on the utilization of nuclear energy for power production is related to the fission reaction. Although the nuclear fission power plants have many distinct advantages over the conventional power plants, the limited world reserve of uranium and thorium that can be practically mined makes the long term prospect of such power plants somewhat uncertain. On the other hand, the thermonuclear fusion reaction, particularly the "burning" of deuterium into helium, utilizes a very abundant fuel. Therefore, if the fusion reaction can be made to generate energy for power plants, the prospect of world energy supply will be very much brighter.

But can the fusion reaction be utilized in terrestrial power plants? This question has been examined by E. Sänger and his collaborators (1, 2).[2] However, a critical reading of Sänger's work will show that part of his analysis is not valid because he has not gone deep enough into the subject. It is the purpose of this note to point out some of the unique features of the thermonuclear power plants and the essential problems in the technical design of such power plants. It will be seen that such engineering projects are truly of stupendous proportions and are a challenge to one's imagination. However, the reward to the welfare of the human race by a successful development of thermonuclear power plants is so great as to make the careful examination of this problem a very worthwhile research project.

2 Thermonuclear Reaction Rate

Thermonuclear reactions are reactions between charged nuclei. Because of the electric charge, necessarily positive, the approach of the nuclei to each other has to overcome the Coulomb repulsion between the nuclei. Therefore, only if the relative kinetic energy of the nuclei is high, can a close enough approach be obtained and a reaction take place. This required kinetic energy is so large that even at temperatures as high as 10^8 K only nuclei in the high energy end of the Maxwellian velocity distribution can achieve reaction. Therefore only a very small fraction of the nuclei participate in the reaction. In other words, the reaction rate is quite small. This observation leads to a great simplification of the calculation: The nuclear distribution can be considered as quasi-steady; i.e., the Maxwellian distribution can in fact be used in spite of the slight lack of thermodynamic equilibrium during the reaction. Gamow and Teller (3) have developed such a theory of thermonuclear reactions. The following is a slightly modified form of the theory suitable for the present purpose.

Considering the colliding particles as rigid spheres, it is well known (4) that the number dN of collisions per unit volume per unit time between particles of type 1 and 2 with kinetic energy of collision between ϵ and $\epsilon + d\epsilon$ is

$$dN = \frac{n_1 n_2}{s}\left(\frac{2\pi kT}{\mu}\right)^{1/2} e^{-\epsilon/kT} 2D_{12}^2 \frac{\epsilon}{kT}\frac{d\epsilon}{kT} \qquad [1]$$

where n_1, n_2 are the number densities of particles of type 1 and 2, respectively; s is the symmetry number, equal to 2 if type 1 and type 2 are the same, and equal to 1 if not; μ is the reduced mass of type 1 and type 2 particles. D_{12} is the average diameter of the two types of particles; i.e., if D_1 and D_2 are the diameters of type 1 and 2 particles, then

$$D_{12} = \frac{1}{2}(D_1 + D_2) \qquad [2]$$

To put this general formula into a form more useful for the present computation, molar fractions ν_1 and ν_2 are introduced

$$\nu_1 = \frac{n_1}{n} \qquad \nu_2 = \frac{n_2}{n} \qquad n = \Sigma_{ni} \qquad [3]$$

where n is the total number of particles per unit volume; the particles may include electrons besides the nuclei. Furthermore, if M_1 and M_2 are the mass of particles of type 1 and 2, and A_1 and A_2 are the corresponding quantities expressed in terms of atomic mass units ("atomic weights" of the nuclei), and M is the mass of one atomic mass unit, then

$$\mu = \frac{M_1 M_2}{M_1 + M_2} = \frac{A_1 A_2}{A_1 + A_2} M = AM \qquad [4]$$

Thus A is the reduced mass expressed in terms of atomic mass units. If V is the relative velocity of the two colliding particles, then ϵ, the relative translational energy, is defined as

$$\epsilon = \frac{1}{2}\mu V^2 \qquad [5]$$

If P is the thermodynamic pressure, then

$$n = P/kT \qquad [6]$$

Equation [6] is true only if the assembly of particles is at thermodynamic equilibrium and if the particles essentially do not interact, i.e., the assembly is a perfect gas. At the extremely low gas density that will be considered, this is true to a high degree of accuracy. Of course, if the sum of the particles is not at thermodynamic equilibrium, e.g., fusion product neutrons which hardly collide a sufficient number of times with other particles to have a Maxwellian distribution of velocity within the dimension of region considered, then such particles must not be considered in calculating the "total" particle density n. The "pressure" produced by such particles on the wall of the containing vessel has to be treated separately. On the other hand, photons, if any, that are almost at thermodynamic equilibrium must be included in the particle density n.

Received Oct. 24, 1955.

[1] Formerly: Robert H. Goddard Professor of Jet Propulsion.

[2] Numbers in parentheses indicate References at end of paper.

The most important modification of [1] is the following: Nuclear reactions cannot be considered as collisions between rigid spheres but are expressed through an effective cross section σ. The effective cross section for collision of rigid spheres is a circle of radius D_{12}. Therefore

$$D_{12}^2 = \sigma/\pi \qquad [7]$$

By substituting [3], [4], [6], and [7] into [1], the number dN is

$$dN = \frac{4\nu_1\nu_2\sigma P^2}{s\sqrt{2\pi AM}}\frac{e^{-\epsilon/kT}}{(kT)^{7/2}}\,\epsilon\, d\epsilon \qquad [8]$$

It is important to note that in general the effective cross section is not a constant but function of energy ϵ. In particular, according to the theory of nuclear reaction, the quantal penetration of Coulomb barrier gives the effective cross section σ as

$$\sigma = \frac{\Lambda^2}{4\pi}\frac{\Gamma AMR^2}{\hbar^2} \times \exp\left[-\frac{2\pi e^2 Z_1 Z_2\sqrt{AM}}{\hbar\sqrt{2\epsilon}} + \frac{4e\sqrt{2AMZ_1Z_2R}}{\hbar}\right] \qquad [9]$$

where Λ is the de Broglie wavelength

$$\Lambda = \frac{2\pi\hbar}{\sqrt{2AM\epsilon}} \qquad [10]$$

R is the radius of the compound nucleus formed during reaction, and can be estimated as

$$R = [1.7 + 1.22\,(A_1 + A_2)^{1/3}] \times 10^{-13}\ \text{cm} \qquad [11]$$

Γ is the half-width of the nuclear resonance level. Z_1 and Z are the nuclear charges in units of electronic charge e.

By substituting [9] and [10] into [8], it is seen that the variation of $dN/d\epsilon$ with respect to ϵ is due to the exponential factor

$$\exp\left\{-\left[\frac{\epsilon}{kT} + \frac{2\pi e^2 Z_1 Z_2\sqrt{AM}}{\hbar\sqrt{2\epsilon}}\right]\right\} \qquad [12]$$

There is a minimum of the quantity within the square bracket with respect to ϵ which corresponds to the maximum of $dN/d\epsilon$. If this ϵ is denoted by ϵ^*, then

$$\frac{1}{kT} = \frac{\pi e^2 Z_1 Z_2\sqrt{AM}}{\sqrt{2}\,\hbar\epsilon^{*3/2}}$$

or

$$\epsilon^* = \left\{\frac{\pi e^2 Z_1 Z_2\sqrt{AM}\,kT}{\sqrt{2}\,\hbar}\right\}^{2/3} \qquad [13]$$

Near this value of ϵ, the expression in the square bracket of [12] can be approximated by

$$\frac{\epsilon}{kT} + \frac{2\pi e^2 Z_1 Z_2\sqrt{AM}}{\hbar\sqrt{2\epsilon}} \cong \frac{\epsilon^*}{kT} + \frac{2\pi e^2 Z_1 Z_2\sqrt{AM}}{\sqrt{2}\,\hbar\sqrt{\epsilon^*}} + \frac{1}{2}\cdot\frac{3}{2}\times$$
$$\frac{\pi e^2 Z_1 Z_2\sqrt{AM}}{\sqrt{2}\hbar\epsilon^{*5/2}}(\epsilon-\epsilon^*)^2 = 3\frac{\epsilon^*}{kT} + \frac{3}{4}\frac{1}{kT\epsilon^*}(\epsilon-\epsilon^*)^2 \qquad [14]$$

Thus, under this approximation, dN can be computed as

$$dN = \frac{4\nu_1\nu_2\Gamma P^2}{s\sqrt{2\pi AM}(kT)^{7/2}}\frac{\pi R^2}{2}\exp\left[\frac{4e\sqrt{2AMZ_1Z_2R}}{\hbar} - \frac{3\epsilon^*}{kT}\right]\times$$
$$\exp\left[-\frac{3}{4}\frac{1}{kT\epsilon^*}(\epsilon-\epsilon^*)^2\right]d\epsilon \qquad [15]$$

By integrating over all ϵ, we have the number N of effective binary collisions per unit vol per unit time as

$$N = \frac{4\pi\nu_1\nu_2 R^2}{s\sqrt{3}}\left(\frac{P}{kT}\right)^2\left(\frac{\Gamma}{kT}\right)\sqrt{\frac{kT}{2AM}}\sqrt{\frac{\epsilon^*}{kT}}\times$$
$$\exp\left[\frac{4e\sqrt{2AMZ_1Z_2R}}{\hbar} - 3\frac{\epsilon^*}{kT}\right] \qquad [16]$$

From [13]

$$\frac{\epsilon^*}{kT} = \left(\frac{\pi^2 e^4 Z_1^2 Z_2^2 AM}{2\hbar^2 kT}\right)^{1/3} \qquad [17]$$

Equations [16] and [17] together determine the reaction rate. There is only one important difference between [16] and the original formula due to Gamow and Teller (3); Gamow and Teller have not included the symmetry number s and thus may be wrong in some cases by a factor of 2.

If we denote by x the quantity $(kT)^{1/3}$, then the temperature dependent part of [16] can be written as

$$x^3\exp\left[-3\left(\frac{\pi^2 e^4 Z_1^2 Z_2^2}{2\hbar^2}\right)^{1/3} x\right] \qquad [18]$$

This quantity clearly has a maximum at some value of x, say x_0; x_0 is determined by

$$8 - 3\left(\frac{\pi^2 e^4 AMZ_1^2 Z_2^2}{2\hbar^2}\right)^{1/3} x_0 = 0 \qquad [19]$$

Equation [19] gives the optimum reaction temperature T_0 for maximum reaction rate at constant pressure as

$$T_0 = \left(\frac{3}{8}\right)^3\frac{\pi^2 e^4 AZ_1^2 Z_2^2}{2k\hbar^2} \qquad [20]$$

By putting in the numerical values of physical constants

$$T_0 = 1.442 \times 10^8 AZ_1^2 Z_2^2 \quad {}^\circ\text{K} \qquad [21]$$

Equations [20] and [21] show that the optimum reaction temperature depends only on the reduced mass and charges of the nuclei and is independent of the details of the reaction. T_0 is the smallest for proton-proton reaction, ($A = 1/2$, $Z_1 = Z_2 = 1$), for which $T_0 = 0.721 \times 10^8$ K.

The important parameter in the expression of reaction rate is the level width Γ. This has to be determined experimentally. However the experimental reaction cross sections are usually expressed as

$$\sigma = \frac{B}{\epsilon}e^{-C/\sqrt{\epsilon}} \qquad [22]$$

where B and C are two empirically determined constants for any one reaction. Same as the preceding paragraphs, [8] and [22] can be combined to give the formulas

$$\frac{\epsilon^*}{kT} = \left(\frac{C^2}{4kT}\right)^{1/3} \qquad [23]$$

$$N = \frac{4\nu_1\nu_2}{s}\left(\frac{B}{kT}\right)\left(\frac{P}{kT}\right)^2\sqrt{\frac{2kT}{3AM}}\sqrt{\frac{\epsilon^*}{kT}}\,e^{-3(\epsilon^*/kT)} \qquad [24]$$

and

$$T_0 = \left(\frac{3}{8}\right)^3\frac{C^2}{4k} \qquad [25]$$

If the optimum temperature T_0 is used as a reference temperature

$$\frac{\epsilon^*}{kT} = \frac{8}{3}\left(\frac{T_0}{T}\right)^{1/3} \qquad [26]$$

For numerical computation, P is usually given in atmospheres. Thus

$$\frac{P}{kT} = 7.34 \times 10^{21} \frac{P}{T} \quad \text{cm}^{-3} \ldots\ldots\ldots\ldots [27]$$

B is usually given in units of barns-kilovolts, thus

$$\frac{B}{kT} = 1.160 \times 10^{-17} \frac{B}{T} \quad \text{cm}^2 \ldots\ldots\ldots\ldots [28]$$

C is usually given in units of kv$^{1/2}$, thus

$$T_0 = 1.528 \times 10^5 C^2 \quad {}^\circ\text{K} \ldots\ldots\ldots\ldots [29]$$

If E is the energy production of a single binary reaction, then the rate of energy production Q per unit vol per unit time is obviously

$$Q = EN \ldots\ldots\ldots\ldots [30]$$

3 Example: Deuterium Reaction

Because of the abundance, of deuterium as a naturally occurring stable isotope of hydrogen, it is of interest to consider the burning of deuterium. The accurate reaction data were given recently by Arnold et al. (5)

$$\sigma = \frac{B'}{\epsilon'} e^{-C'/\sqrt{\epsilon'}} \ldots\ldots\ldots\ldots [31]$$

where ϵ' is the deuteron energy in kilovolts in the usual laboratory coordinate system, and $B' = 288$ barns-kv, $C' = 45.7$ kv $^{1/2}$. Since the ϵ in [22] is the relative kinetic energy defined by (5) and the ratio of deuterium mass and the reduced mass is 2 in a deuteron-deuteron reaction,

$$\epsilon' = 2\epsilon \ldots\ldots\ldots\ldots [32]$$

Therefore, by using Arnold's data, the reaction constants B and C are

$$B = B'/2 = 144 \text{ barnes-kv} \ldots\ldots\ldots\ldots [33]$$

$$C = C'/\sqrt{2} = 32.36 \text{ kv}^{1/2} \ldots\ldots\ldots\ldots [34]$$

Equation [29] immediately gives the optimum temperature T_0 for deuteron-deuteron reaction as

$$T_0 = 1.600 \times 10^{8\circ} \text{ K} \ldots\ldots\ldots\ldots [35]$$

According to Arnold et al., the deuteron-deuteron reaction branches, with almost equal probability, into two reactions

$$_1H^2 + {}_1H^2 \rightarrow {}_1H^3 + {}_1p^1 \ldots\ldots\ldots\ldots [36]$$

$$_1H^2 + {}_1H^2 \rightarrow {}_2He^3 + {}_0n^1 \ldots\ldots\ldots\ldots [37]$$

Since the masses of the atomic species are given as follows

$$\left.\begin{aligned} A({}_1H^2) &= 2.014735 \\ A({}_1H^3) &= 3.016997 \\ A({}_2He^3) &= 3.016977 \\ A({}_1p^1) &= 1.008142 \\ A({}_0n^1) &= 1.008982 \end{aligned}\right\} \ldots\ldots\ldots\ldots [38]$$

The reaction [36] then produces

$$2 \times 2.014735 - (3.016997 + 1.008142) = 0.04331 \text{ amu} = 4.03 \text{ Mev} = 6.46 \times 10^{-6} \text{ ergs} \ldots\ldots [39]$$

The reaction [37] produces

$$2 \times 2.014735 - (1.008982 + 3.016177) = 0.003511 \text{ amu} = 3.27 \text{ Mev} = 5.24 \times 10^{-6} \text{ ergs} \ldots\ldots [40]$$

However, in a thermonuclear reaction chamber, [36] and [37] do not represent the end of reactions. The reaction products are immediately thermalized by elastic collisions with other particles; then the following reactions are possible

$$_2He^3 + {}_0n^1 \rightarrow {}_1H^3 + {}_1p^1 \ldots\ldots\ldots\ldots [41]$$

$$_1H^3 + {}_1H^2 \rightarrow {}_2He^4 + {}_0n^1 \ldots\ldots\ldots\ldots [42]$$

$$_2He^3 + {}_1H^2 \rightarrow {}_2He^4 + {}_1p^1 \ldots\ldots\ldots\ldots [43]$$

At first sight it seems that the reaction [41] depending upon both components of the reaction products of low concentration will be very much less frequent than [42] and [43] depending upon only one component of reaction product. However at thermal energies corresponding to temperatures of the order of 10^8 K, the cross section of [41] is of the order of 10 barns, while according to Arnold (5), the reaction cross sections of [42] and [43] are very much smaller. Therefore [41] is in fact the only reaction of importance while [42] and [43] can be neglected. This being the case, then eventually all of the deuteron-deuteron reaction really results in the production of tritium according to [36]. Therefore the average energy production E for every deuteron-deuteron reaction is according to [39]

$$E = 6.46 \times 10^{-6} \text{ ergs} \ldots\ldots\ldots\ldots [44]$$

The energy produced by burning a unit mass of deuterium is thus

$$\frac{6.46 \times 10^{-6} \times 2.388 \times 10^{-8} \times 0.605 \times 10^{24}}{4.029} \text{ cal/gr} = 2.31 \times 10^{10} \text{ cal/gr} \ldots\ldots [45]$$

Now assume $T = T_0 = 1.600 \times 10^8$ K, $P = 100$ atm. The feed gas D_2 will be completely ionized at this temperature, and reacting mixture will be composed initially of equal numbers of deuterons and electrons. Thus $\nu_1 = \nu_2 = {}^1/_2$, $s = 2$. Then using [24], [26], [30] the energy production Q per unit vol per unit time is

$$Q = 6.46 \times 10^{-6} \times \frac{1}{2} \times \frac{1.160 \times 10^{-17} \times 144}{1.600 \times 10^8} \times \left(\frac{7.34 \times 10^{23}}{1.600 \times 10^8}\right)^2 \sqrt{\frac{8}{3} \times \frac{2 \times 8.316 \times 10^7 \times 1.6 \times 10^8}{3 \times 1.007}} \times e^{-8} \text{ ergs/cm}^3 \text{ sec} = 0.365 \times 10^8 \text{ ergs/cm}^3 \text{ sec} = 3.65 \text{ watts/cm}^3 = 0.874 \text{ cal/cm}^3 \text{ sec} \ldots\ldots [46]$$

It is interesting to note that this volume rate of energy generation is only $^1/_{10}$ of the rate of generation as in a modern aircraft gas turbine combustion chamber using hydrocarbon fuel. Therefore in spite of the extremely high temperature, thermonuclear reaction using deuterium is a relatively slow reaction. The reason for this anomaly is the extremely low density of the hot gas: There simply are not enough deuterons in a unit volume to give high reaction rate. However, as Sänger (1) has shown, other nuclei generally give even lower rates of energy production.

4 Thermonuclear Reaction Chamber

The moderate volume rate of energy production together with the extremely high gas temperature naturally call ones attention to the problem of quenching of the "flame" by excessive cooling. This problem is in fact the central problem of thermonuclear reaction chamber. There is certainly a critical size, say a critical diameter, of the reaction chamber below which the reaction cannot be maintained. As a very rough first estimate, one may take the chemical combustion as a model, and use the mean free path as the sizing length. Because of the relatively slow thermonuclear reaction, the chemical model should be one of poor reactivity. Thus the quenching diameter at atmospheric pressure can be taken as

1 cm. The pressure effect on quenching can be thought of as a Reynolds number effect. Then the quenching diameter at 100 atm will be $^1/_{100}$ cm. To translate this value to thermonuclear reaction chamber, one notes the fact that the ratio of mean free path for the two cases is approximately 10^6. Thus the rough estimate of the critical diameter D_c of the reaction chamber is

$$D_c = \frac{1}{100} \times 10^6 \text{ cm} = 100 \text{ meters} \quad [47]$$

If the length is to be ten times the diameter, then the thermonuclear reaction chamber is a vessel of 100 meters diam and 1000 meters long built to withstand a pressure of 100 atmospheres!

To examine the quenching problem in some detail, one must first estimate the mean free path of the fully ionized mixture of deuteron and electron. If n is the particle density, and if σ_s is the scattering cross section of the particles, then the general equation for the mean free path l is

$$l = \frac{0.177}{n\sigma_s} = \frac{0.177kT}{P\sigma_s} = 2.41 \times 10^{-23} \frac{T}{P\sigma_s} \quad [48]$$

For fully ionized particles, the cross section σ_s can be computed approximately according to Lin, Resler, and Kantrowitz (6) as

$$\sigma_s = 8.10 \left(\frac{e^2}{3kT}\right)^2 \log \left(\frac{kT}{e\sqrt{4\pi P}} \bigg/ \frac{e^2}{3kT}\right) \quad [49]$$

By taking $T = 10^8$ K, σ_s from [49] is equal to 4.00×10^{-20} cm². Then [48] gives a mean free path of $l = 603$ cm. With such a large free path, the transfer of energy by collisions is extremely slow and inefficient. To improve the chances of collision, some particles of larger size must be introduced, e.g., atoms of heavier elements. The heavier atoms can have their outer electrons stripped (ionized) at the prevailing high temperature, but since some electrons remain attached to the nucleus, the size of the partially ionized atom can still be of the order of Å. Then such particles will be a scattering cross section of the order of 10^{-16} cm². Even with only one per cent of such heavier elements in the mixture, the mean free path will be brought down to a few centimeters. This is indeed the mean free path used in the size estimate of the preceding paragraph. Needless to say, the heavier atoms introduced must not capture neutrons appreciably so as not to interfere with the very important energy producing reaction of [41].

However, even with the presence of heavy partially ionized atoms, the mixture will be still practically transparent to high energy neutrons generated by reaction [37]. The energies carried by them cannot then be "kept" in the gas by collision, but rather are received directly by the walls of the reaction chamber. This is a direct energy leak and makes the quenching problem very much more difficult. In fact, out of the reaction [37], only the kinetic energy of $_2He^3$ is kept within the gaseous mixture. This energy is only $^1/_4$ of the total given by [40], or 1.31×10^{-6} ergs. The energy produced by the reaction [36] is of course retained in the gaseous mixture and is equal to the difference of energies given by [39] and [40] or 1.22×10^{-6} ergs. Hence 50 per cent of the deuteron-deuteron reactions have an effective energy production of only

$$(1.31 + 1.22) \times 10^{-6} = 2.53 \times 10^{-6} \text{ ergs} \quad [50]$$

The average of the reaction energy kept in the mixture is thus, using [39]

$$\frac{1}{2} [2.53 + 6.46] \times 10^{-6} \text{ ergs} = 4.50 \times 10^{-6} \text{ ergs} \quad [51]$$

Compared with gross energy production given by [44], this is only 69.6 per cent; 30.4 per cent of energy produced is delivered directly to the solid walls of the chamber.

Out of the energy kept in the reacting mixture, given by [51] for one single binary reaction or

$$1.606 \times 10^{10} \text{ cal/gr} \quad [52]$$

a good fraction will be absorbed by the reacting deuterium in entering the flame: The deuterium gas is heated, dissociated, and finally ionized to reach the full flame temperature of say 1.600×10^8 K. According to Sänger (1), to heat up to this temperature, the deuterium takes up approximately

$$10^9 \text{ cal/gr} = 0.1 \times 10^{10} \text{ cal/gr} \quad [53]$$

Now the crucial question is: how many grams of deuterium have to be heated in order that one gram of deuterium will be burned to completion? In other words, what is the combustion efficiency of the flame in the reaction chamber? By comparing [52] with [53], it is seen that if 16.06 grams of deuterium have to be heated to flame temperature to get one gram of deuterium burned, then there will be no heat left to be conducted and radiated to the wall *through* the gaseous mixture. But there must be heat conducted and radiated to the wall because the wall, being necessarily of solid material, must be at a temperature, say 2000 K, which is very much lower than the flame temperature of 1.600×10^8 K. This shows that the ratio of mass to be heated and actually burned must be less than 16.06.

For lack of more accurate information, consider a combustion efficiency of the flame zone to be $^1/_6$. That is, six grams of deuterium have to be heated to have one gram actually burned. Then the energy available for conduction and radiation to the wall per gram of deuterium burned is, according to [52] and [53]

$$(1.606 - 6 \times 0.1) \times 10^{10} \text{ cal/gr} = 1.006 \times 10^{10} \text{ cal/gr} \quad [54]$$

Therefore, by comparing with [45], only less than one-half of the gross energy production is available for "cooling" loss. In fact, with [46], the "cooling" loss energy Q_c produced per unit vol of flame per unit time is

$$Q_c = \frac{1.006}{2.31} \times 0.874 \text{ cal/cm}^3 \text{ sec} = 0.382 \text{ cal/cm}^3 \text{ sec} \quad [55]$$

Now let it be assumed that the flame in the 100 m diam reaction chamber be a cylindrical volume of some 60 m diam and 120 m long. Then within this 120 m of flame, the wall will receive by conduction and radiation *through* the mixture, a heat flux density q_c equal to

$$q_c = \frac{\frac{\pi}{4} \times 6000^2 \times 0.382}{\pi \times 10{,}000} = 343 \text{ cal/cm}^2 \text{ sec} = 8.75 \text{ Btu/in.}^2 \text{ sec} \quad [56]$$

This corresponds to a black body radiation at 3990 K.

The question is, of course, whether the heat flux q_c actually equals that given by [56]. For the specified conditions in the reaction chamber, if the actual q_c is larger than [56], then the critical reaction chamber diameter must be larger than the assumed 100 m. If less, then the critical diameter can be smaller. Therefore, one of the basic problems of thermonuclear reaction chamber design is the calculation of q_c or radiation heat flux through a gas layer of variable composition and variable temperature. The technical complication here is, of course, the fact that here the radiation mean free path is large in comparison with the physical dimensions and therefore the simple method developed by astrophysicists for the interior of stars is not applicable. On the other hand, all essential basic information required for the calculation is now available. The problem is thus only complicated but not insurmountable. But, in any event, the flame is almost transparent due to the low density and almost complete ionization. In fact, within the flame, radiation

will come almost only from the specially introduced heavy atoms which are, however, of very, very low density. Therefore, the flame, although of extremely high temperature, is a relatively weak radiator. Hence the comparatively low effective black body temperature of 3990 K may not be far from being correct.

5 Thermonuclear Power Station

The part of energy directly transmitted to the wall by fast neutrons is the difference between [45] and [52]; thus the total energy flux to the wall q is

$$q = \frac{\frac{\pi}{4} \times 6000^2 \times \left[0.382 + 0.874 \times \frac{2.31 - 1.606}{2.31}\right]}{\pi \times 10{,}000} =$$

$$582 \text{ cal/cm}^2 \text{ sec} = 14.89 \text{ Btu/in.}^2 \text{ sec} \qquad [57]$$

Although nearly one-half of this energy is realized by slowing down the fast neutrons and is thus distributed in a layer of wall material, not merely delivered at the surface of the wall, nevertheless the tremendous heat density poses a cooling problem which cannot be solved by conventional cooling methods. It seems that the only feasible method is that of transpiration cooling. That is, the wall is made of porous material, say porous carbon or graphite, and cold deuterium gas is forced by pressure through the wall into the reaction chamber. Heat in the wall is picked up by the coolant gas and returned to the reaction chamber. By using a large enough quantity of coolant gas, the wall temperature can be kept at the desired low temperature of, say, 2000 K. In fact, the application of transpiration cooling to nuclear reactors has already been considered by Kaeppeler (7). He, however, has not included the important "spacing heating" effects of neutron slowing-down.

Behind the section of reaction chamber occupied by the flame zone, the heat flux due to neutrons is greatly reduced; then the coolant gas forced into the reaction chamber merely serves to lower the temperature of the gas from the flame zone (exhaust gas). At the end of the reaction chamber, the temperature across the chamber cross section should be fairly uniform and at, say, 1000 K. The discharge pressure of this body of hot gas is of course essentially the chamber pressure which is taken to be 100 atm in the above discussion. The high pressure hot gas can be used to generate power through a gas turbine. It is perhaps worth while to note that the product gas is expected to contain only the weakly radioactive $_1H^3$ and thus should give no difficulty for the power generating machinery. The exhaust from the turbine after being cooled by heat exchanger will pass through the waste extraction system for removing the nuclear "ash." The purified gas will contain of course mainly D_2, but also has a very small concentration of H_2 and T_2 produced by reaction [36] and [41]. This gas together with small amount of make-up D_2 to replace the deuterium burned is then compressed to high pressure and fed through the porous wall back to the reaction chamber. This then completes the cycle of the power plant. Fig. 1 is a diagram representing the components and the process of the system.

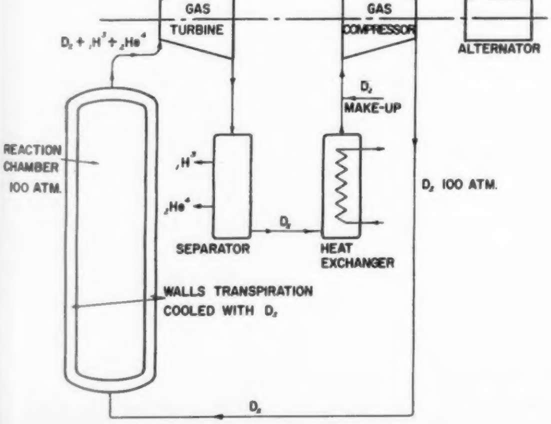


Fig. 1 Schematic diagram of thermonuclear power station

Of course, by cycling the gaseous mixture repeatedly through the reaction chamber, the concentration of H_2 and T_2 will build up and eventually participate importantly in the energy production through reaction [42], and other reactions. These reactions actually produce the nuclear ash $_2He^4$. Finally the composition of feed gas to the reaction chamber will be stabilized at a fixed ratio of H_2, D_2, and T_2 with the production of H and T by reactions [36] and [41] balanced by consumption of H and T through reactions [42] and others. Then the over-all result is that of feeding in deuterium D_2 and taking out $_2He^4$. Thus the reaction chamber effectively converts deuterons to helium according to

$$_1H^2 + {}_1H^2 \rightarrow {}_2He^4 + \text{energy} \qquad [58]$$

and the energy produced per gram of deuterium burned is very much larger than given by [45]. Furthermore, in this final stage the reaction scheme is considerably more complicated than that discussed in Section 3 and the volume rate of energy generation and heat flux must be somewhat different from that calculated previously. However, these calculations will not be attempted here since the purpose of this study is merely to give a general outline of the problem.

6 Ignition

According to the studies made by Sänger (1), the ignition temperature, i.e., the temperature at which the rate of energy production is just balanced by the rate of energy lost, mainly through radiation, with the deuteron-deuteron reaction is approximately 10^7 K. Naturally the question is how can the thermonuclear reaction be initiated by heating the gaseous mixture to this very high temperature. Before the advent of nuclear fission and the fission bomb, such high temperatures seemed unapproachable. But now this is definitely not so. It may even be possible to obtain ignition without using the fission reaction. But at the moment, one can only say that ignition of the thermonuclear reaction is certainly possible; no detailed scheme can, however, be suggested.

7 Thermonuclear Power Industry

The rate of energy production Q according to [46] is 0.00365 kw/cm³ in the flame zone. If, as assumed previously, the flame zone is a cylinder of 60 m diam and 120 m long, the total energy production is

$$0.00365 \times (\pi/4) \times 6000^2 \times 12{,}000 = 1.238 \times 10^9 \text{ kw} \qquad [59]$$

If the thermodynamic efficiency of the power plant cycle is 25 per cent, the power of the station is

$$0.25 \times 1.238 \times 10^9 \text{ kw} = 0.309 \times 10^9 \text{ kw} \qquad [60]$$

Thus continuous operation of the plant will product *annually* electric energy of the amount

$$0.309 \times 10^9 \times 24 \times 365 = 2.71 \times 10^{12} \text{ kw hr} \qquad [61]$$

In 1954, the annual electric energy production in the United States was approximately 0.5×10^{12} kw hr. Thus in one thermonuclear power plant, perhaps one of minimum size, the capacity is over five times the total effective capacity of the United States! This points to the extreme importance of determining the critical quenching size of the thermonuclear reaction chamber accurately. The speculations in the pre-

ceding sections are based upon an assumed diameter of 100 m for the reaction chamber. Smaller size and lower flame temperature will naturally reduce the scale of the power plant. However for the deuteron-deuteron reaction, the ignition temperature is roughly 10^7 K. For steady burning, the flame temperature cannot be below this temperature.

To conclude this discussion, comparison of thermonuclear energy and other energy sources will be made: According to [45], the fusion energy of deuterium is

$$2.31 \times 10^{10} \times 1.8 \text{ Btu/lb} = 4.16 \times 10^{10} \text{ Btu/lb of } D_2 \quad [62]$$

The fission of one pound of U-235 gives 3.14×10^{10} Btu. Therefore fusion energy is almost 4/3 times as large as fission energy. Since the natural isotope concentration of deuterium in hydrogen is 1:7000, in terms of natural hydrogen, the fusion energy is

$$(4.16 \times 10^{10})/7000 = 5.94 \times 10^{6} \text{ Btu/lb of hydrogen} \quad [63]$$

or, referred to water

$$(5.94 \times 10)/9 = 6.60 \times 10^{5} \text{ Btu/lb of } H_2O \quad [64]$$

If the average chemical energy of coal is taken as 11,000 Btu/lb, one pound of water is potentially equivalent to sixty pounds of coal! But even all this is based upon only partial burning of deuteron to triton and proton. With complete burning into $_2He^4$, the thermonuclear energy of deuterium will be still larger. Therefore, if thermonuclear power plants can actually be constructed, then the source of fusion energy far exceeds the other terrestial energy resources, chemical or fission.

References

1 Sänger, E., *Astronautica Acta*, vol. 1, 1955, pp. 61–88.

2 Kaeppeler, H. J., *J. Astronautics*, vol. 2, 1955, pp. 50–56.

3 Gamow, G., and Teller, E., *Physical Review*, vol. 53, 1938, p. 608. Cf. Gamow, G., Critchfield, C. L., "Theory of Atomic Nucleus and Nuclear Energy Sources," Oxford, 1949, chap. 10.

4 Fowler, R. H., and Guggenheim, E. A., "Statistical Thermodynamics," Cambridge, 1939, p. 493.

5 Arnold, W. R., Phillips, J. A., Sawyer, G. A., Stovall, E. J., Jr., and Tuck, J. L., *Physical Review*, vol. 93, 1954, p. 483.

6 Lin, S.-C., Resler, E. L., and Kantrowitz, A., *Journal of Applied Physics*, vol. 26, 1955, p. 95.

7 Kaeppeler, H. J., Jet Propulsion, vol. 24, 1954, p. 316.

Comments on Hsue-shen Tsien Paper[1]

JESSE L. GREENSTEIN[2]

Mount Wilson and Palomar Observatories, Pasadena, Calif.

Dr. Tsien had little contact with physicists or astronomers during his studies of a thermonuclear power plant, so that the methods used in his derivation of reaction yields are not the most modern. The concept of effective collision diameter [9, 11] is far from precise; however, as pointed out following [22] it is necessary to fit the experimental data empirically, so that essentially only the *forms* of [16, 22] are needed. This fitting, or even a different integration method,

(*Continued on page 575*)

[1] Prof. Greenstein had been asked by the editors to review the Tsien paper. His report recommended that it be published, but he expressed reservations about some aspects of the analysis. Because of Dr. Tsien's absence from the country, the points at issue could not be resolved in the usual manner by private correspondence. Accordingly, Prof. Greenstein gave us his permission to publish his comments, and it is left to the reader to form his own conclusions.

[2] Professor, California Institute of Technology.

Climatization of Animal Capsules During Upper Stratosphere Balloon Flights

DAVID G. SIMONS[1] and DRUEY P. PARKS[2]

Holloman Air Development Center, Holloman Air Force Base, N. Mex.

Experiments requiring exposure of animals to primary cosmic radiation at altitudes above 90,000 ft on 24-hr balloon flights have led to the development of environmental control techniques. Simple methods for supplying oxygen and removing carbon dioxide were developed. Internal capsule temperatures have been maintained at very nearly room temperature on 24-hr flights by providing adequate insulation to use animal heat at night, and by cooling the capsule with a water-can cooler during the daytime.

Introduction

THE frontier of manned controlled flight is inexorably ascending, penetrating one-by-one, atmospheric conditions which are biologically equivalent to space. The life-supporting function of atmospheric pressure is equivalent to space above 63,000 ft. The protecting blanket of air which prevents penetration of primary cosmic particles below 75,000 ft becomes space equivalent in this respect above the 120,000-ft region. When the nature of primary cosmic particles in the upper stratosphere was first established about five years ago, Schaefer (1)[3] and Tobias (2) calculated the biological hazard they might pose. All but a few of the slowest and lightest nuclei constituting primary cosmic radiation are too heavy and energetic to be duplicated by even the most modern nuclear accelerators. For instance, they cannot produce one billion electron volt (BEV)/nucleon iron nuclei which are an example of the minimum energy heavy particles that are considered most hazardous biologically.

The known engineering problems challenging flight in the upper stratosphere are formidable. It is of paramount importance that questions such as the necessity and practicability of shielding from cosmic ray primaries be resolved, especially if it can be proved that no serious hazard to manned flight exists for at least limited periods of time. During the past four years, the Aero Medical Field Laboratory of Holloman Air Development Center, N. Mex., has been conducting balloon-borne biological experiments to determine experimentally the degree and nature of this hazard.

The animals selected for the experiments: hamsters, mice, guinea pigs, and monkeys, require more exacting environmental control than men. They cannot pull on a jacket if it becomes uncomfortably cold, nor can they adjust controls to suit their needs. The animal capsules were designed to maintain a minimum pressure of 13 to 14 psi, and temperatures between 65 and 80 F. Carbon dioxide absorbing apparatus was used, but no special consideration was given to humidity control. It was not found necessary.

The design of the animal capsule (3, 4) was determined by equipment available, and by the requirement for a minimum mass of absorbing material above the specimens to permit

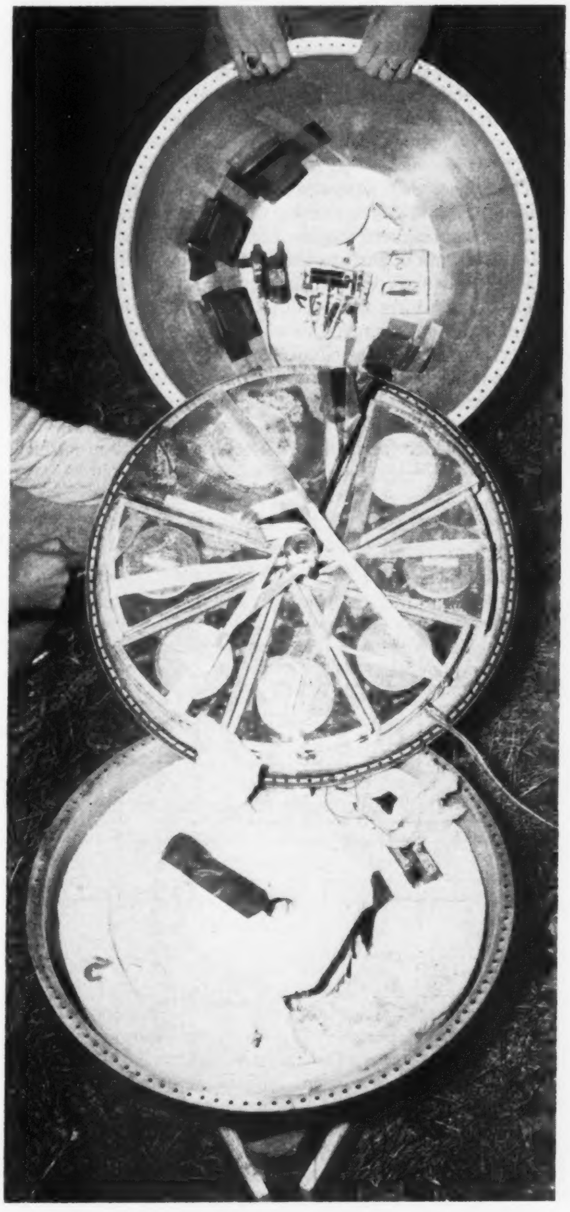


Fig. 1 View of AMFL capsule loaded for flight showing from above down: aluminum cover containing the temperature and pressure coder and recorder, oxygen demand valve, and boxes of experimental specimens; load plate carrying wedge-shaped cages loaded with black mice; and aluminum bottom section containing tube of soda lime, batteries, and water-can cooler in the center

Presented at the Annual Meeting ARS, Chicago, Ill., Nov. 14-18, 1955.

[1] Major, USAF(MC), Chief, Space Biology Branch, Aero Medical Field Laboratory. Mem. ARS.

[2] 1st Lt., USAF, Chief, Space Biophysics Section, Aero Medical Field Laboratory.

[3] Numbers in parentheses indicate References at end of paper.

maximum exposure to cosmic particles. To obtain the most exposure possible, each flight was usually designed for 24- to 30-hr duration. Balloon performance (5) is strongly dependent upon payload weight; therefore, each control technique and every change in design was critically evaluated to obtain maximum reliability with minimum weight.

The animal capsule illustrated in Fig. 1 consists of two $^1/_{32}$-in.-thick hemispheres of spun aluminum which seal between them a load plate that carries the experimental animals. The 24-in. diam pressurized sphere is enclosed in a 2-in.-thick cover of styrafoam or lockfoam to provide thermal insulation. Oxygen cylinders are attached to the load harness which forms a sling that carries the capsule on the balloon load line.

Temperature Control

Temperature control considerations are influenced profoundly by the fact that heat equilibrium at troposhere pressures is established largely by air conduction whereas, in the upper stratosphere, it is determined almost exclusively by radiation. Conductive heat exchange between the capsule and the air above 100,000 ft has proved negligible. At the earth's surface, air temperature and rate of air flow are very significant factors in determining capsule temperature, but in the upper stratosphere they make little difference.

Measurements of surface temperatures on a capsule floating at altitude showed that during the daytime the top and bottom temperatures were about 130 and 30 F, respectively, while at night they averaged about −100 and −50 F, (6). The number and altitude of clouds influenced the bottom temperature considerably. Clouds during the daytime increased the temperature, and clouds at night decreased it. At night, the altitude of the clouds made a marked difference; the higher and colder the clouds, the colder the bottom surface of the capsule. Thus, temperature control for a daytime 8-hr flight, poses an entirely different problem than control for a continuous 24-hr flight, since the same system must then handle both the day and night situations.

The temperature record obtained from AMFL Flight No. 61 (Fig. 2) is an excellent example of a day flight of an insulated, aluminum-surfaced sphere floating in the upper stratosphere without any internal heat source. The capsule was chilled during its ascent through the −60 F heat conductive air of the tropopause between 40,000 and 60,000 ft. At floating altitude of approximately 130,000 ft, the capsule surface radiation equilibrium temperatures averaged about room temperature—proved by its stable internal temperature of 68 F. At night such a capsule would become insufferably cold, and it would become insufferably hot during the day if more than a few heat-producing animals were placed in it.

Experience proved that three inches of styrafoam or lockfoam insulation was sufficient to keep a capsule full of mice or guinea pigs comfortable at night without any additional heat source. With a method for removing the heat produced by the animals during the daytime, excellent temperature control could be expected throughout a 24-hr flight.

A refrigeration system was devised based on the fact that water boils at least ten degrees below room temperature at the low atmospheric pressure found above 90,000 ft. In fact, theoretically at 112,000 ft it boils at 32 F. The can is simply vented to the outside so that it will remain cold at altitude. The system used is illustrated in Fig. 3. The cooler water can is placed in an insulated chamber below the animals. Whenever the animal chamber above becomes too warm, a thermostat activates a blower which circulates the warm air around the cooler-can. Since each gram of water that boils away takes nearly 600 calories with it, this has proved to be a very efficient cooling system.

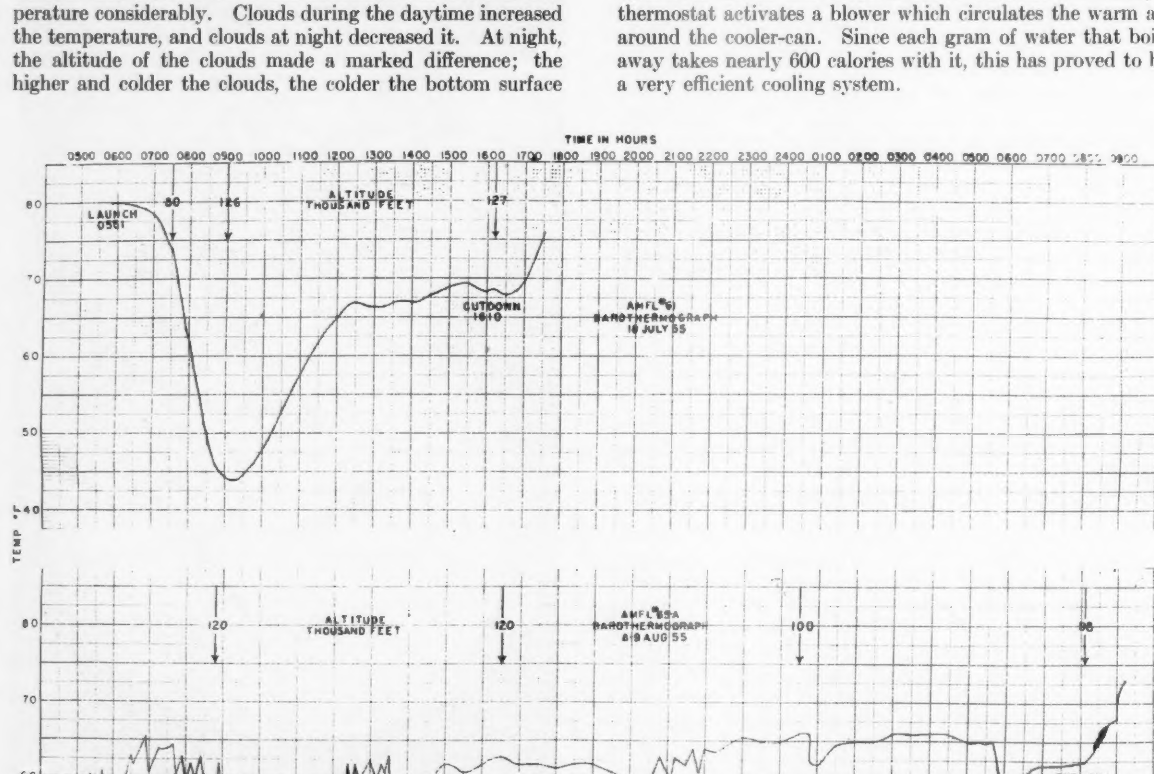


Fig. 2 Records of internal capsule temperature during a daylight flight without internal heat source or cooling (flight #61) and during a 24-hr flight with animals and the thermostatically controlled cooling system (flight #65)

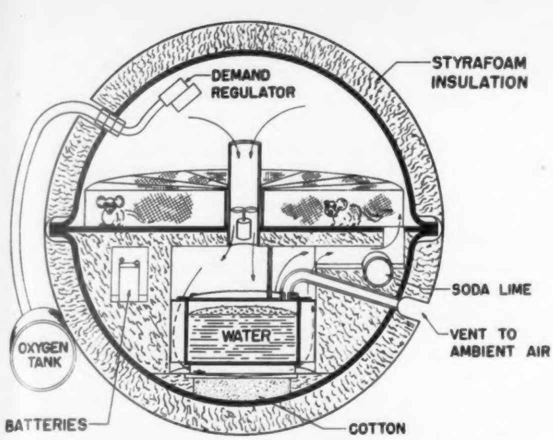


Fig. 3 Schematic of AMFL animal capsule showing the oxygen supply and water-can cooling systems

The temperature record of AMFL Flight No. 65 (Fig. 2) shows the control obtained on a flight carrying 12 guinea pigs above 95,000 ft for 24 hr. The temperature oscillations occurring approximately every 15 min are the result of varying length of duty cycles of the cooling fan which was operated by a hypersensitive thermoswitch. The cooling fan was on continuously from 1345 to 2030. The variation in heat load between the morning and afternoon is apparently due to variations in cloudiness beneath the balloon. The morning was clear, the afternoon broken cloudy. The cooling fan operated only once during the night at 0045, in spite of the sensitive thermoswitch and warm recorded temperature. Most likely it did not operate more frequently because the thermoswitch was much more closely coupled, thermally, to the aluminum capsule wall than the recording element. The wall temperature is considerably below capsule air temperature at night since it is the primary means of heat loss from the capsule. During the daytime the upper half of the capsule wall represents a heat source since the outer surface temperature is 30 or more deg warmer than the capsule air temperature.

Carbon Dioxide Absorption

Approximately 85 per cent of the volume of oxygen consumed by mammals is exhaled as carbon dioxide. The maximum tolerable level within the capsule is about 3 per cent. Thus it can be seen that a continuously operating reliable system for removal of carbon dioxide is essential. The commonest and most readily available absorbent is soda lime. Deliquescing materials such as potassium hydroxide were considered unsatisfactory because of difficulty controlling the highly corrosive liquid produced. Granular lithium hydroxide, which has been used in other applications, would offer a saving in weight, although it is considerably more expensive.

The absorbent material was simply placed in screened containers on early flights carrying relatively few animals. With increasing animal loads, it became necessary to use a forced draft system to insure efficient utilization of the absorbent. A simple fan blower forced air through a polyethylene tube filled with soda lime. This technique has proved very satisfactory and reliable.

Humidity

The necessity to control humidity, from a purely medical point of view, depends directly on temperature. At low room temperatures, a high relative humidity causes little discomfort. When ambient temperature approaches body temperature (above 95 F) a high relative humidity becomes critical.

Under flight conditions the capsule humidity dropped during the warm daytime, and increased only at night when the capsule was cool, making increased humidity tolerable. By carefully minimizing factors that increased humidity, and taking advantage of factors which decreased it, no special humidity absorbing device was required.

The sources of water vapor within the capsule were expired air and urine, the latter being much the larger source. Therefore, urine was held by an absorbent pad placed between the cages and the nonporous load plate, permitting evaporation upward only.

Water vapor was precipitated on the cooler can, capsule walls, and absorbed by the carbon dioxide absorber. Operation of the water-can cooling system during the daytime maintained the relative humidity between 60 and 80 per cent. This occurred because the warm air from the animal chamber (see Fig. 3) was circulated around the water can which was 20 to 40 deg cooler. Condensed water was drained to an absorbent pad capturing it as a liquid to prevent its return to vapor. At night the heat produced by the animals was lost entirely through the capsule walls. As this situation reached equilibrium, the capsule walls became 5 to 10 deg cooler than the air in the capsule. Water condensing on these walls held the relative humidity between 90 and 95 per cent. The soda lime carbon dioxide absorbing unit was adjusted to a low rate of air flow. both to minimize battery drain and to prevent saturation of the absorbent with water vapor.

By contrast, the situation in the capsule after landing on the ground is critical, both for heat and humidity control. The water-can cooler is inoperative below 80,000 ft. The warm air and sunshine on the surface of the capsule add heat so that the capsule walls are warm, not cold, permitting the relative humidity to approach 100 per cent at the same time the temperature is quickly rising.

Oxygen Supply

Arbitrarily selecting a minimum tolerable oxygen partial pressure of 80 mm of Hg and considering the vapor tension of water, minimum capsule pressures for atmospheres of various oxygen percentages are presented in Table 1. The minimum pressure indicates the approximate pressure which must remain in the capsule to prevent the animals from experiencing hypoxia.

Table 1 O_2% and pressure of capsule atmosphere providing sea level alveolar oxygen partial pressure

Oxygen %	Capsule pressure psi
21	14.7
40	8.3
50	6.7
80	4.4
100	3.6

Thus, an intracapsular atmosphere of 100 per cent oxygen at 15 psi provides oxygen for the animals for an additional four hours. However, a pure oxygen atmosphere poses a very serious fire hazard, and most mammals develop pulmonary congestion when subjected to more than 80 per cent oxygen atmosphere at 15 psi for more than 12 to 24 hr. A 50 per cent oxygen atmosphere has been selected as a fair compromise among the various factors.

It is interesting to note that in the closed system employed on these flights the percentage of oxygen should not change, if a constant pressure is maintained from a pure oxygen source. Oxygen within the capsule is metabolized by the animals to carbon dioxide and water. The gaseous component, CO_2, is then absorbed completely by soda lime resulting in a pressure deficit due entirely to loss of oxygen which is replaced by pure oxygen. The nitrogen is neither

metabolized, nor released in significant amounts. The percentage of atmospheric oxygen increases only if there is a leak in the capsule permitting the escape of nitrogen which is replaced by oxygen.

Numerous methods of supplying oxygen have been considered. First, the capsule was simply flushed to 100 per cent oxygen and pressurized slightly. This technique permits a few animals to be encapsulated for a day or two, or a full load of animals for five hours. Whenever the internal capsule pressure has dropped to less than about 8 psi by the time of descent into denser atmosphere, the capsule has been crushed by external pressurization. Standard Air Force oxygen cylinders using both 1800-psi and 450-psi working pressures were considered. The high pressure cylinders represented no weight saving and introduced a filling problem. The greater bulk of the 450-lb cylinders was no problem when they were mounted outside the capsule. Liquid oxygen saved very little weight because of the small quantity required, would be more complicated to handle, and presented a logistic problem. Fig. 3 shows a diagram of the oxygen system used. Standard Air Force D-2 and G-2 cylinders were used, depending upon the volume of oxygen required. The cylinders were connected to each other and to the capsule by flexible hose so that the oxygen lines would not be broken at the time of landing. A series of failures was experienced using copper tubing. The pressure demand valve in the capsule was a two-stage unit which maintained capsule pressure within one psi even though cylinder pressure varied from 35 to 450 psi.

References

1 Schaefer, H. J., "Exposure Hazards from Cosmic Radiation Beyond the Stratosphere and in Free Space," U. S. Naval School of Aviation Medicine, Project no. NM 001 059.13.03, Research Report no. 31, March 1952.

2 Tobias, C. A., "Radiation Hazards in High Altitude Aviation," *The Journal of Aviation Medicine*, vol. 23, no. 4, August 1952, p. 345.

3 Simons, D. G., "Methods and Results of One Year of Balloon Flights with Biological Specimens," *The Journal of Aviation Medicine*, vol. 25, no. 4, August 1954, p. 380.

4 Simons, D. G., "Techniques for Exposing Living Specimens to Primary Cosmic Ray Particles," Holloman Air Development Center, Technical Report TR54-16, 1955.

5 Haig, T. O., "Plastic Balloons for High Altitude Research," *Journal of Aviation Medicine*, vol. 25, no. 4, August 1954, p. 351.

6 Simons, D. G., "Surface Temperatues of Animal Capsules Floating Above 80,000 Feet," Holloman Air Development Center, Technical Report 56-6, May 1956.

The Application of the Shock Tube to the Study of Problems of Hypersonic Flight

(*Continued from page 554*)

than can be obtained in the conventional shock tube. This possibility is of special interest for materials testing because it could be applied to the development of a short duration blowdown tunnel with high stagnation temperature conditions. The flow entering the tunnel would remain relatively uniform for much longer periods of time than could be obtained in the conventional hypersonic shock tunnel. It is possible, using this tailored method, to obtain testing times per foot of shock tube six times as long as can be obtained in the previously described conventional shock tunnel (8). A program is currently being undertaken at Cornell Aeronautical Laboratory to investigate the possibility of using a shock tube of this nature for materials testing purposes.

References

1 Hirschfelder, J. O., and Curtiss, C. F., "Thermodynamic Properties of Air," University of Wisconsin, NRL Reports CM-472 and CM-518, 1948.

2 Hilsenrath, J., and Beckett, C. W., "Thermodynamic Properties of Argon-Free Air (0.78847 N_2, 0.21153 O_2) to 15,000° K," National Bureau of Standards Report 3991, April 1955.

3 Christian, R. H., Duff, R. E., and Yarger, F. L., "Equation of State of Gases by Shock Wave Measurements 2—The Dissociation Energy of Nitrogen," *Journal of Chemical Physics*, vol. 23, Nov. 1955, pp. 2045–2049.

4 Squire, W., Hertzberg, A., and Smith, W. E., "Real Gas Effects in a Hypersonic Shock Tunnel," Cornell Aeronautical Laboratory Rep. AD-789-A-1, AEDC-TN-55-14, March 1955.

5 Libby, P. A., and Bloom, M. H., "Facilities for Experimental High Speed Aerodynamic Research at the Polytechnic Institute of Brooklyn," Proceedings of the Conference on High Speed Aeronautics, Polytechnic Institute of Brooklyn, Jan. 20–22, 1955, pp. 363–373.

6 Steinmetz, C. P., "Theoretical Study of Nitrogen Fixation by the Electric Arc," *Chemical and Metallurgical Engineering*, vol. 22, 1920, pp. 299–304.

7 Resler, E. L., Lin, S. C., and Kantrowitz, A. R., "The Production of High Temperature Gases in Shock Tubes," *J. Applied Physics*, vol. 23, Dec. 1952, pp. 1390–1399.

8 Hertzberg, A., Smith, W. E., Glick, H. S., and Squire, W., "Modifications of the Shock Tube for the Generation of Hypersonic Flow," Cornell Aeronautical Laboratory Report no. AD-789-A-2, AEDC-TN-55-15, March 1955.

9 Hertzberg, A., and Smith, W. E., "A Method for Generating Strong Shock Waves," *Journal of Applied Physics*, vol. 25, Jan. 1954, p. 130.

10 Rudinger, G., "Wave Diagrams for Nonsteady Flow in Ducts," D. Van Nostrand, New York, 1955.

11 Hertzberg, A., "A Shock Tube Method of Generating Hypersonic Flows," *J. Aero. Sci.*, vol. 18, Dec. 1951, pp. 803–805.

12 Glick, H. S., Hertzberg, A., and Smith, W. E., "Flow Phenomena in Starting a Hypersonic Shock Tunnel," Cornell Aeronautical Laboratory Report no. AD-789-A-3, AEDC-TN-55-16, March 1955.

13 Blackman, V. H., "Vibrational Relaxation in O_2 and N_2," Princeton University, Department of Physics, Technical Report II-20, May 1955.

14 Chabai, A. J., and Emrich, R. J., "Measurement of Wall Temperature and Heat Flow in the Shock Tube," *Journal of Applied Physics*, vol. 26, June 1955, pp. 779–780.

15 Bendersky, D., "A Special Thermocouple for Measuring Transient Temperatures," *Mechanical Engineering*, vol. 75, Feb. 1953, pp. 117–121.

16 Vidal, R., "Model Instrumentation Techniques for Heat Transfer and Force Measurements in a Hypersonic Shock Tunnel," Cornell Aeronautical Laboratory Report no. AD-917-A-1, Feb. 1956.

17 Glick, H. S., Squire, W., and Hertzberg, A., "A New Shock Tube Technique for the Study of High Temperature Gas Phase Reactions," Fifth Symposium (International) on Combustion, Reinhold, New York, 1955, pp. 393–402.

18 Romig, M. F., "The Normal Shock Properties for Air in Dissociation Equilibrium," *J. Aero. Sci.*, vol. 23, Feb. 1956, pp. 185–186.

Calculation of a Mollier Diagram for the Decomposition Products of Aqueous Hydrogen Peroxide Solutions of 90 Weight Per Cent H_2O_2 Content

JOHANN G. TSCHINKEL[1]

Redstone Arsenal, Huntsville, Ala.

An enthalpy-entropy (Mollier) diagram was designed for the products of decomposition of 90 weight per cent aqueous H_2O_2 solution. The method of calculation is described. Metric technical units were used. The pressure range covered is 0.1 to 100 kg/cm.[2] Reference state is 0 C temperature, one kg/cm² pressure, liquid water, and gaseous oxygen.

Nomenclature

a = weight fraction of a component
ata = technical atmosphere = 1 kg/cm² absolute
h = enthalpy, kcal/kg, reference state: t = 0° C, p = 0, liquid H_2O
ln = natural logarithm
log = decadic logarithm
M = molecular weight, kg/mol
p = partial pressure, ata = kg/cm² absolute
P = total pressure, $P = p_{H_2O} + p_{O_2}$, sum of partial pressures
s = entropy, kcal/kg·deg C, reference state: t = 0° C and P = 1 ata, liquid H_2O
t = temperature, °C
T = temperature, °K
v = specific volume, m³/kg
x = mole fraction of a component

Subscripts

g = gaseous
H_2O = water, gaseous, as product of decomposition
O_2 = oxygen as product of decomposition
PO = hydrogen peroxide solutions where PO-90 indicates 90 weight per cent H_2O_2
sat = saturation
w = water, liquid

Introduction

MOLLIER diagrams for decomposition products from H_2O_2 solutions of 70, 75, and 80 weight per cent concentration are available from (1)[2] and (2).

More recently, manufacturers have been able to produce higher concentrations. Ninety weight per cent strength has become a well-established standard item on which much research and development has been based. It was, therefore, thought worth while to calculate and design an enthalpy-entropy (Mollier) diagram for this particular strength.

To facilitate comparison with the above quoted Mollier diagrams for lower concentrations, the metric system and the reference temperature of 0 C were retained.

The procedure of calculation is described.

Received April 15, 1955.

[1] Chief, Combustion and Fuels Section, Guided Missile Development Division.

[2] Numbers in parentheses indicate References at end of paper.

Weight Fraction (a) and Mol Fraction (x) of Decomposition Products

The equation of decomposition of pure H_2O_2 is

$$(H_2O_2)_{liq} = (H_2O)_{liq} + {}^1/_2(O_2)_g + 23{,}200 \text{ cal (at 0 C, 1 atm)} \quad [1]$$

PO-90 decomposes into the weight fractions

$$\begin{aligned} a_{H_2O} &= 0.900\ (0.5296) + 0.100 = 0.5766 \\ a_{O_2} &= 0.900\ (0.4704) \qquad\qquad = \underline{0.4234} \\ & \qquad\qquad\qquad\qquad\qquad\quad 1.0000 \end{aligned}$$

The mol fractions are

$$\begin{aligned} x_{H_2O} &= 0.7075 \\ x_{O_2} &= \underline{0.2925} \\ & \quad 1.0000 \end{aligned}$$

Assuming Dalton's Law to hold accurately, which is the case only with perfect gases, the fractional *partial pressure* is equal to the mol fraction, and

$$p_{H_2O} = x_{H_2O} \cdot P \quad [2]$$

$$p_{O_2} = x_{O_2} \cdot P = P - p_{H_2O} \quad [2a]$$

The pressure unit used here is the "technical atmosphere," defined as one kg per cm². The "physical atmosphere" is then

$$\text{(phys) atm} = 760 \text{ Torr} = 1.033 \text{ ata (kg/cm}^2)$$

Enthalpy in Superheated Region

The enthalpy of the gas mixture is the sum of the partial enthalpies. The enthalpy unit is kcal/kg.

The partial enthalpies refer to the temperature of the mixture, and the *partial* pressure of the component.

The data of steam were taken from (3). Since the "Dampftabellen" go up to 550 C only, data for higher temperature were taken from (4) and converted into metric units.

The data for oxygen were taken from (5). Oxygen is considered a perfect gas and, therefore, its enthalpy independent of pressure. In the range of the diagram, the largest error thus introduced is only 0.25 per cent of the enthalpy for PO-100 products at 20 ata and 200 C and even smaller for lower H_2O_2 concentrations.

The enthalpy of the mixture is then

$$h = a_{H_2O} \cdot h_{H_2O} + a_{O_2} \cdot h_{O_2} \quad [3]$$

Enthalpy at Saturation

At a given total pressure, the saturation temperature of steam is found from the table of saturated steam as the temperature corresponding to the partial pressure of steam.

The enthalpy h_{H_2O} at this temperature and partial pressure is interpolated on the same table, and from (5), we interpolate h_{O_2} for t_{sat}.

Enthalpy in Supersaturated Region (Wet Steam Region)

The weight fraction of liquid water is introduced as an additional independent variable designated a_w. The liquefaction of part of the steam changes the composition of the gas phase and, therewith, the partial pressures.

$$a_{H_2O} = \overline{a_{H_2O}} - a_w$$
$$a_{O_2} = 1 - a_{H_2O}$$

where $\overline{a_{H_2O}}$ designates total water content and a_{H_2O} water content in gas phase only.

The mol fraction for the gas phase is calculated from a_{H_2O} and a_{O_2}, excluding a_w, to yield the partial pressure of steam, p_{H_2O}. The saturation temperature for this p_{H_2O} is found from steam table. The corresponding enthalpies are interpolated and the total enthalpy is

$$h = a_w(h_w) + a_{H_2O}(h_{H_2O}) + a_{O_2}(h_{O_2}) \qquad [4]$$

If the change of partial pressure (and saturation temperature) with liquefaction is neglected, the result is about 0.8 per cent higher, at the most, than the more accurate result above. Because of this small difference, the *isotherms* are omitted on the diagram in the supersaturated region, as they very nearly coincide with isobars.

Entropy

The entropy of the mixture of decomposition products is composed of the partial entropies of the components.

The partial entropy of steam is found from the steam tables for the partial pressure of steam.

Oxygen is considered as a perfect gas and its entropy is composed of the standard entropy as found in tables for 1.0 ata and the temperature t, and of a pressure term

$$s_{O_2} = s(t, 1 \text{ ata}) - R/32 \log_e (p_{O_2}/1.033) = s(t, 1 \text{ ata}) - 0.1430 \log_{10} p_{O_2} + 0.0020 \qquad [5]$$

The corrective term, +0.0020, becomes necessary because the standard entropies in literature are commonly based on $p = 1$ atm $= 760$ Torr and not on 1 ata $= 1$ kg/cm^2. Neglecting this difference would introduce an error of about 0.3–0.1 per cent.

Entropy in Superheated Region

$$s_{t,p} = a_{H_2O} \cdot s_{H_2O}(t, p_{H_2O}) + a_{O_2}[s_{O_2}(t, 1 \text{ ata}) - 0.1430 \log_{10} p_{O_2} + 0.0020] \qquad [6]$$

To interpolate entropy between pressures and temperatures, we must remember that the absolute molar entropy of a perfect gas

$$S = C_p \ln T - R \ln P \qquad [7]$$

and the commonly used entropy difference with respect to a reference level of T_0 and P_0

$$S - S_0 = C_p \ln (T/T_0) - R \ln (P/P_0) \qquad [7a]$$

Therefore, the entropy change with pressure at constant temperature is proportional to the logarithm of reciprocal pressure

$$\frac{s_{p_1} - s_p}{s_{p_1} - s_{p_2}} = \frac{\log p/p_1}{\log p_2/p_1} \qquad [8]$$

At constant pressure, we interpolate, if s_{T_1} and s_{T_2} are given

$$\frac{s_{T_2} - s_T}{s_{T_2} - s_{T_1}} = \frac{\log (T_2/T)}{\log (T_2/T_1)} \qquad [9]$$

where we neglect the change of C_p over the range $T_2 - T_1$.

The error incurred by linear interpolation is only about 0.5 per cent.

To avoid some need for log calculation, a graph of s_{O_2} (1 ata) versus log T was used.

Entropy at Saturation

Proceed analogously as before with enthalpy and entropy in superheated region.

Entropy in Supersaturated Region

The entropy of the liquid water is found in tables for saturated steam. The procedure is analogous to the one with enthalpy.

The entropy of the mixture is composed of

$$s = a_w (s_w) + a_{H_2O} (s_{H_2O}) + a_{O_2} (s_{O_2}) \qquad [10]$$

Specific Volume

The unit of the specific volume is m^3/kg. The density of the mixture is the sum of the densities of the components at their *partial* pressure and the specific volume is the reciprocal of the density

$$v = \frac{1}{1/v_{H_2O} + 1/v_{O_2}} \qquad [11]$$

A general procedure to derive the specific volume is as follows: The specific volume of steam is picked from the steam tables for temperature, t, and partial pressure, p_{H_2O}. The specific volume of water which is needed in the supersaturated region is likewise found in the steam tables. The specific volume of oxygen is easily calculated from the equation of state for a perfect gas with a satisfactory accuracy.

To interpolate v_{H_2O} or v in a large pressure interval, we replace the obvious procedure $v_p = (v_1p_1/p)$ or $= (v_2p_2/p)$ by the more accurate procedure of first interpolating the pv product linearly for p and dividing by the pressure p.

$$v_p = \left[p_1v_1 - (p_1v_1 - p_2v_2) \frac{p - p_1}{p_2 - p_1} \right] \frac{1}{p} \qquad [12]$$

For O_2, we calculate

$$v_{O_2} = \frac{26.496 \cdot T}{p_{O_2}} \qquad [13]$$

where

$$R/M = \frac{847.87}{32} = 26.496 \left[\frac{m}{°K} \right]$$

Derivation of Isochores

For deriving the desired isochores of 5.0, 3.0, 2.0, etc., m^3/kg, it is most convenient to find the entropy coordinates along an isotherm.

Given are the entropy coordinates for two pressures, p_1 and p_2, at constant temperature t; s_1 and s_2. Let the intersection of the isochore at $v =$ const with the isotherm at $t =$ const be the desired point.

As isothermal entropy differences, $s_1 - s_2$, are proportional to the log of the pressure ratio P_2/P_1; they will conversely be proportional to log v_1/v_2. With real gases, this is an approximation only, and the intervals should be taken small.

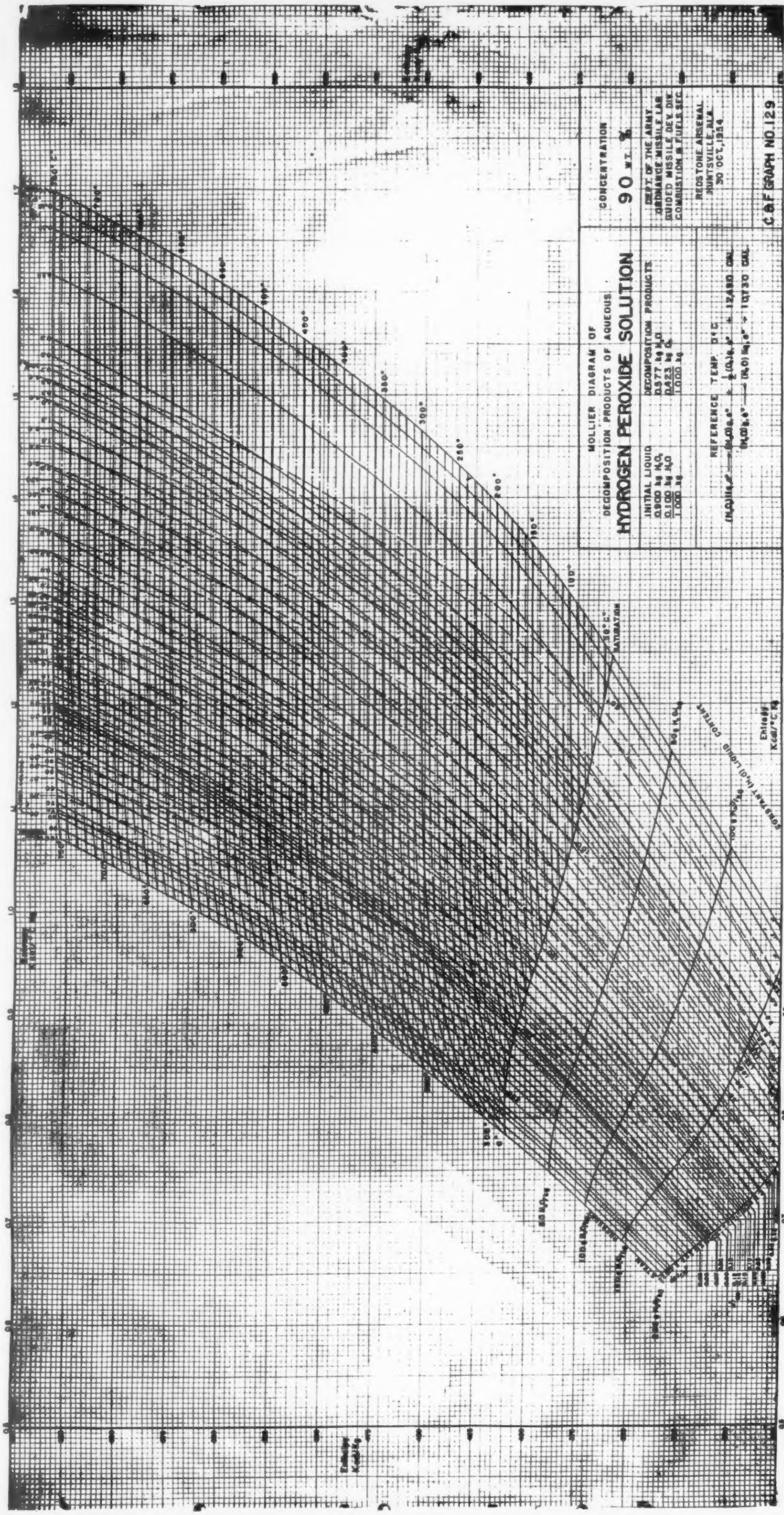
$$\frac{s_1 - s}{s_1 - s_2} = \frac{\log v_1/v}{\log v_1/v_2} \qquad [14]$$

Design of the Diagram

Data of enthalpy and entropy as functions of temperature (in steps of 50 C) and pressure (0.1, 1, 5, 10, 25, 50, 75, 100 ata) were tabulated.

The tables of enthalpy versus temperature and pressure,

(*Continued on page 575*)



Blueprints of the diagram can be obtained from the author in sizes 12 × 22 in. or 30 × 50 in.

Rapid Estimation of Specific Impulse of Solid Propellants

ALBERT O. DEKKER[1]

Aerojet-General Corp., Azusa, Calif.

The short method of Hirschfelder and Sherman for the calculation of the thermodynamic properties of gun propellants is adapted to the quick estimation of specific impulse of solid propellants for rockets. When this approximate procedure is applied to a series of propellants with flame temperatures equal to or greater than 2000 K and specific impulses of 200 to 245 lbf sec lbm^{-1}, at 1000 psia the results are within about 2 per cent of those given by the detailed thermodynamic method which assumes mobile equilibrium. For a propellant ingredient which forms only gaseous products, it is necessary to know only the empirical formula and heat of formation from which a set of three additive constants is calculated in less than ten minutes. The specific impulse of any particular combination can then be estimated from the additive constants for the components in less than five minutes. The method is limited to cases with negligible dissociation and to fuel-rich mixtures.

Introduction

PREPARATORY to the formulation of new solid propellants or the synthesis of new propellant ingredients, it is convenient to be able to estimate rapidly the specific impulse of the propellant or the contribution to specific impulse made by the new material so that the less promising ones can be eliminated without resort to time-consuming experimental work. In the present paper simple equations are derived and applied to the quick estimation of specific impulse of solid propellants. The method used in deriving these equations is similar to that used by Hirschfelder and Sherman (1a)[2] in the approximate calculation of the thermochemical properties of gun propellants.[3] It is assumed that burnt propellant gas consists only of nitrogen, hydrogen chloride, and those components involved in the water-gas reaction; and that the composition of this gas is frozen at an average value determined by the elementary composition together with a more or less arbitrary assumption. The heat capacity and heat content of this gas can be estimated with these assumptions; and from these values the specific impulse is estimated. In the following sections general equations are derived for carrying out these operations, an example is given, and a comparison is made with results obtained by detailed calculations.

Derivation of Equations

The equation for specific impulse

$$I = \sqrt{0.434\, nRT_c \left(\frac{2\gamma}{\gamma - 1}\right)\left[1 - \left(\frac{p_e}{p_c}\right)^{(\gamma-1)/\gamma}\right]} \quad [1]$$

is transformed into the more convenient form

$$I_{sp} = 0.932 \sqrt{C_p T_c \left[1 - \left(\frac{p_e}{p_c}\right)^{nR/C_p}\right]} \quad [2]$$

by use of the following substitutions

$$\gamma = \frac{C_p}{C_v} \qquad \gamma - 1 = \frac{nR}{C_v} \quad [3, 4]$$

where

I_{sp} = the specific impulse in lb force sec lb mass^{-1}
n = the number of mols of gas produced per 100 grams of propellant
R = the gas constant, 1.987 cal per mol per degree Kelvin
T_c = the isobaric adiabatic flame temp in degrees Kelvin
C_p = the heat capacity of the gases at constant pressure in cal per 100 grams per degree Kelvin
C_v = the heat capacity at constant volume
γ = the ratio of C_p to C_v
p_e = the exit pressure of the gases
p_c = the chamber pressure

Because the gases from the propellants which will usually be dealt with are cooled from about 2500 K to about 1000 K, the average heat capacity between these two temperatures is taken as the definition for C_p.

By use of an approximation similar to that suggested by Hirschfelder and Sherman for isochoric conditions, the isobaric adiabatic flame temperature is assumed to be given approximately by

$$T_c = 2500 + \frac{H_{rel}}{C_p^{3000K-2000K}} \quad [5]$$

in which H_{rel} is the heat in calories released by 100 grams of the propellant gases in cooling from the flame temperature to 2500 K, and $C_p^{3000K-2000K}$ is the average heat capacity in calories per 100 grams per degree of the gases between 3000 K and 2000 K. Examination of the data on the heat capacity of propellant gas mixtures at various temperatures showed that the average heat capacity between these two temperatures was about 4 to 11 per cent, or on the average about 9 per cent, greater than the average heat capacity for the same gas mixture between 2500 K and 1000 K. Consequently Equation [2] can be written

$$I_{sp} = 0.932 \sqrt{\left[2500\, C_p + 0.92\, H_{rel}\right]\left[1 - \left(\frac{p_e}{p_c}\right)^{nR/C_p}\right]} \quad [6]$$

We may now define potential P as the function

$$P = \frac{2500\, C_p + 0.92\, H_{rel}}{100} \quad [7]$$

which when substituted in Equation [6] yields

$$I_{sp} = 9.32 \sqrt{P\left[1 - \left(\frac{p_e}{p_c}\right)^{nR/C_p}\right]} \quad [8]$$

The quantities n, C_p, and P are assumed to be additive functions of the composition of the propellant such that their values may be calculated from the corresponding individual values for the components by use of equations of the type

$$n = \sum_i n_i x_i \quad [9]$$

where n_i is the number of mols of gas produced by the i-th

Received Nov. 20, 1955.

[1] Associate Director, Propellant Development Dept. Mem. ARS.

[2] Numbers in parentheses indicate References at end of paper.

[3] For a detailed explanation of how the Hirschfelder-Sherman method can be used, see (1b).

component, and x_i is the weight fraction of the i-th component in the propellant.

The quantity n_i is estimated from the equation

$$n_i = \mathrm{C} + (1/2)(\mathrm{H} + \mathrm{N}) + \mathrm{HCl} \qquad [10]$$

in which C, H, and N represent, respectively, the number of gram atoms of carbon, hydrogen, and nitrogen in 100 grams of component, and HCl the number of mols of hydrogen chloride which would be produced in 100 grams of propellant component. If hydrogen chloride is formed, the hydrogen associated with it is not counted in the hydrogen represented by the symbol H in Equation [10].

In deriving the equation for the estimate of C_p, calculated equilibrium compositions of the gases from several resin-oxidizer propellants at 2500 K were examined, and it was noted that the ratio of the number of water molecules to the number of carbon dioxide molecules was between 0.2 and 7. Because many of the values were in the neighborhood of 2 or 3, the value 2.0 was taken as representative. Accordingly, the average heat capacity of a propellant gas between 1000 K and 2500 K is assumed to be given approximately by

$$C_p = 0.67\, C_1 + 0.33\, C_2 \qquad [11]$$

where C_1 is the heat capacity calculated from the elementary composition on the assumption that no carbon dioxide is present, and C_2 is the heat capacity calculated on the assumption that no water is present. C_{pi} is assumed to be given by a similar expression so that

$$C_{pi} = 0.67\,[n_{CO}C_{CO} + n_{H_2O}C_{H_2O} + n_{H_2}C_{H_2} + n_{N_2}C_{N_2} + \mathrm{HCl}\,C_{HCl}]_1 + 0.33\,[n_{CO}C_{CO} + n_{CO_2}C_{CO_2} + n_{H_2}C_{H_2} + n_{N_2}C_{N_2} + \mathrm{HCl}\,C_{HCl}]_2 \qquad [12]$$

in which n_{CO}, n_{H_2O}, n_{H_2}, n_{N_2}, n_{CO_2}, and HCl are the number of mols of carbon monoxide, water, hydrogen, nitrogen, carbon dioxide, and hydrogen chloride in 100 grams of gas; the symbols such as C_{CO} denote the heat capacity in calories per mol per degree for the particular gas between 1000 K and 2500 K, and the numerals 1 and 2 after the brackets indicate the following two methods by which the values for the gas composition are to be derived from the elementary composition.

Method 1	Method 2
(no carbon dioxide)	(no water)
$n_{CO} = \mathrm{C}$	$n_{CO} = 2(\mathrm{C}) - \mathrm{O}$
$n_{H_2O} = \mathrm{O} - \mathrm{C}$	$n_{CO_2} = \mathrm{O} - \mathrm{C}$
$n_{H_2} = \frac{\mathrm{H}}{2} - \mathrm{O} + \mathrm{C}$	$n_{H_2} = \frac{\mathrm{H}}{2}$
$\mathrm{HCl} = \mathrm{HCl}$	$\mathrm{HCl} = \mathrm{HCl}$
$n_{N_2} = \mathrm{N}/2$	$n_{N_2} = \mathrm{N}/2$

The resulting expression for C_{pi} is

$$C_{pi} = 4.27(\mathrm{C}) + 3.98(\mathrm{H}) + 4.23(\mathrm{O}) + 4.21(\mathrm{N}) + 8.27(\mathrm{HCl}) \qquad [13]$$

The heat capacities used were obtained from the compilation of the National Advisory Committee for Aeronautics (2). This equation is limited to substances which contain only the elements whose symbols appear in the equation. It is a fair approximation of the heat capacity even when the ratio of the concentration of water to that of carbon dioxide is not close to the value of 2 assumed in the derivation of this approximate equation. Because both water and carbon dioxide have high heat capacities compared to those of hydrogen and carbon monoxide, the heat capacity of a mixture of the gases which partake in the water-gas equilibrium is not sensitive to the ratio of concentration of water to carbon dioxide.

The derivation of an expression for P_i involves first the derivation of an equation for H_{rel}, the heat released by cooling 100 grams of propellant gas from the adiabatic flame temperature to 2500 K.

In considering the following thermodynamic cycle the enthalpy changes H_4 and H_5 are neglected on the assumption that the materials are ideal, and the enthalpy change H_6 is zero because the process is adiabatic

$$\begin{tikzcd}
\begin{array}{l}\text{Propellant}\\(100\text{ grams})\\298\text{ K, }14.7\text{ psi}\end{array} \arrow[r, "H_1"] \arrow[d, "H_5"] & \begin{array}{l}\text{Elements}\\298\text{ K, }14.7\text{ psi}\end{array} \arrow[r, "H_2"] & \begin{array}{l}\text{Propellant gases}\\298\text{ K, }14.7\text{ psi}\end{array} \arrow[dd, "H_3"] \\
\begin{array}{l}\text{Propellant}\\298\text{ K, }1000\text{ psi}\end{array} \arrow[d, "H_6"] & & \\
\begin{array}{l}\text{Propellant gases}\\T_c\text{, }1000\text{ psi}\end{array} \arrow[r, "H_{rel}"] & \begin{array}{l}\text{Propellant gases}\\2500\text{ K, }1000\text{ psi}\end{array} & \begin{array}{l}\text{Propellant gases}\\2500\text{ K, }14.7\text{ psi}\end{array} \arrow[l, "H_4"']
\end{tikzcd}$$

Consequently

$$H_{rel} = H_1 + H_2 + H_3 \qquad [14]$$

The heat evolved in the first step H_1 is simply the heat of formation in calories of 100 grams of the propellant from the elements in their standard states at 298 K; consequently for the i-th constituent we may write

$$H_1 = 1000\, \Delta H_i \qquad [15]$$

in which ΔH_i is the increase in heat content of the system in kilocalories for the formation of 100 grams of the constituent.

The heat evolved in the second step H_2 is given by

$$-H_2 = n_{CO_2}\, \Delta H_{CO_2} + n_{CO}\Delta H_{CO} + n_{H_2O}\Delta H_{H_2O} + \mathrm{HCl}\Delta H_{HCl} \qquad [16]$$

in which the standard heats of formation are in calories per mol.

The heat evolved in the third step H_3 is

$$-H_3 = n_{CO_2}H_{CO_2} + n_{CO}H_{CO} + n_{H_2O}H_{H_2O} + n_{N_2}H_{N_2} + n_{H_2}H_{H_2} + \mathrm{HCl}\, H_{HCl} \qquad [17]$$

The symbols such as H_{CO_2} represent the heat required to change a mol of the particular gas from 298 K to 2500 K.

The heat released, H_{rel}, is then calculated from Equation [14] and the equation

$$H_{rel} = 0.67\,(H_{rel_{(1)}}) + 0.33\,(H_{rel_{(2)}}) \qquad [18]$$

The subscripts 1 and 2 denote that the calculation is to be made by use of the gas composition calculated by use of the previously described methods 1 and 2. The resulting equation is

$$H_{rel} = 1000\,(\Delta H_i) - 44400(\mathrm{C}) - 8420(\mathrm{H}) + 52900(\mathrm{O}) - 8880(\mathrm{N}) + 4630(\mathrm{HCl}) \qquad [19]$$

The heats of formation used were obtained from the compilation by the Bureau of Standards (3). Combination of Equations [7], [13], and [19] yields the following expression for the potential of the i-th constituent

$$P_i = 9.2(\Delta H_i) - 302(\mathrm{C}) + 22.0(\mathrm{H}) + 592(\mathrm{O}) + 23.6(\mathrm{N}) + 249(\mathrm{HCl}) \qquad [20]$$

The expansion term $1 - (p_e/p_c)^{nR/C_p}$ is easily obtained from the plot of C_p/n vs. the expansion term given in Fig. 1.

In summary, the estimation of the specific impulse of a solid propellant at a chamber pressure of 1000 psia and an exhaust pressure of 14.7 psia involves estimating the number of mols of gas by Equation [10], the heat capacity of the gas by Equation [13], the potential of the propellant by Equation [20], the effect of expansion through the nozzle by Fig. 1, and the specific impulse by Equation [8]. For a monopropellant all these manipulations can be carried out in fifteen minutes or less depending on whether a slide rule or desk calculator is used.

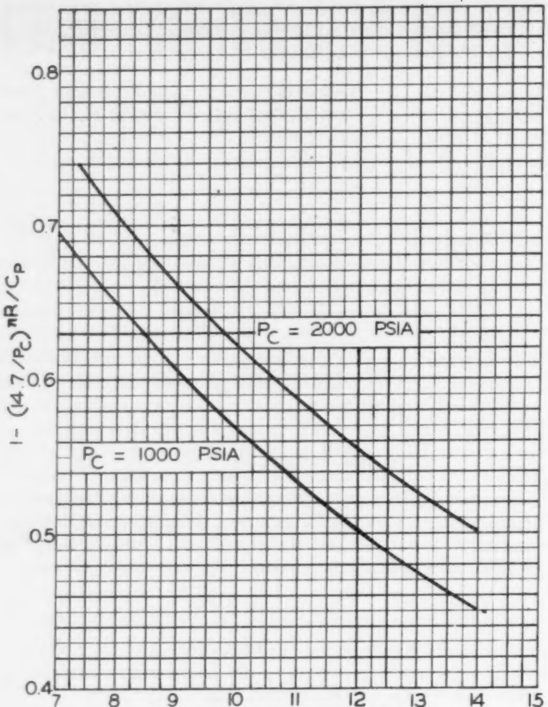


Fig. 1 Expansion term vs. molal heat capacity for use in estimating specific impulse by the short method

Example

An example of the calculation of the required constants for a typical propellant component, nitroglycerin, follows

Formula: $CH_2NO_3\,CHNO_3\,CH_2NO_3$
Formula weight: 227
Heat of formation: −37 kcal/100 gm
C = 1.32; H = 2.20; O = 3.96; N = 1.32
n_i = 3.08 gm mol/100 gm
C_{p_i} = 36.7 cal/100 gm/K
P_i = 1685 cal/gm

These constants are then tabulated as in Table 1 for future use.

An example of the estimation of the specific impulse of a propellant which contains several components is summarized in Table 2. The example is based on a typical double-base propellant (4) for which the basic constants have already been given in Table 1.

Comparison with Detailed Calculation

Comparisons have been made of the values of specific impulse estimated by this method with those calculated by the detailed thermodynamic method on the assumption that equilibrium was maintained in the exhaust gas during expansion through the nozzle. The flame temperatures covered the range from 1500 K to 3000 K and the specific impulses a range from 190 to 245 lbf sec lbm^{-1} at 1000 psia. Generally, the agreement was within 2 per cent and the average error was 1 per cent. In one case for a flame temperature below 2000 K the error was as large as 6 per cent, but this is attributed to the presence of carbon in the propellant gas and the inapplicability of the short method to a system of this type. It is concluded that in new propellant systems the estimates by this quick method are only what their name implies, i.e., estimates. In precise work the short-method estimates must be supplemented by an appropriate detailed calculation to test their accuracy. After this has been accomplished the short method provides a rapid method for the exploration of the magnitude of the effects to be expected in formulation changes.

Comparison of Equations [2] and [8] shows that the isobaric adiabatic flame temperature of the propellant can be estimated by the relationship

$$T_c = \frac{100\,P}{C_p} \qquad [21]$$

The values obtained by this means are usually within approximately 100 K of the flame temperatures calculated by the detailed method, except in cases for which dissociation is significant or products other than those assumed in the derivation are present in significant amount.

Certain limitations of this short method should be indicated. Care should be taken to use the method only for estimating the specific impulse of propellants containing the stoichiometric quantity or less of oxidizer. Also, the method does not take into account the effects of dissociation at high flame temperatures. This last limitation is not so serious as might be expected, because frequently the specific impulse calculated by the detailed method on the assumption of chemical equilibrium during expansion is not greatly different from that calculated on the assumption of no dissociation and frozen equilibrium. The short method most nearly resembles the latter type of calculation.

Table 2 Estimation of specific impulse of a double base propellant

Substance	x_i	n_ix_i	$C_{pi}x_i$	P_ix_i
Nitrocellulose (13.25%N)	0.522	2.04	20.3	559
Nitroglycerin	0.435	1.34	16.0	733
Diethyl phthalate	0.033	0.28	1.8	−22
Ethyl centralite	0.010	0.10	0.6	−23
	1.000	3.76	38.7	1247

C_p/n = 10.3 and from Fig. 1 the expansion term for a chamber pressure of 1000 psia is 0.558.

$I_{sp} = 9.32\sqrt{1247(0.558)}$ = 246 lbf sec lbm^{-1}.

Acknowledgments

The author is indebted to Dr. Stanley C. Burket for

Table 1 Additive constants for use in rapid estimation of specific impulse

Substance	ΔH_i kcal/100 gm	Composition, gm atom/100 gm C	H	O	N	n_i gm mol/100 gm	C_{pi} cal/100 gm/K	P_i cal/gm
Nitrocellulose (13.25%N)	−58[1]	2.125	2.60	3.66	0.95	3.90	38.9	1071
Nitroglycerin	−37[2]	1.32	2.20	3.96	1.32	3.08	36.7	1685
Diethyl phthalate	−27[3]	5.40	6.30	1.80	...	8.55	55.8	−675
Ethyl centralite	−84[3]	6.35	7.46	0.37	0.75	10.46	61.5	−2290

[1] Ref. (5).
[2] Ref. (6).
[3] Ref. (4) p. 11.

stimulating discussions which formed the basis for part of the analysis presented here, and to Dr. Ralph W. Lawrence for constructive criticism of the derivations of the equations.

References

1a Hirschfelder, J. O., and Sherman, J., "Simple Calculation of Thermochemical Properties for Use in Ballistics," OSRD Report no. 935, Oct. 14, 1942 (unclassified).

1b "Rocket Fundamentals," ATI 3532 (unclassified), OSRD Report, pp. 273–276.

2 Huff, V. N., Gordon, S., and Morrell, V. E., "General Method and Thermodynamic Tables for Computation of Equilibrium Composition and Temperature of Chemical Reactions," NACA Technical Report no. 1037, 1951.

3 "Selected Values of Chemical Thermodynamic Properties," U. S. Bureau of Standards, Circular 500.

4 Wimpress, R. N., "Internal Ballistics of Solid-Fuel Rockets," McGraw-Hill, New York, 1950.

5 Jessup, R. S., and Prosen, E. J., "Heats of Combustion and Formation of Cellulose and Nitrocellulose," *Journal Research, National Bureau of Standards*, vol. 44, 1950, p. 387.

6 Taylor, J., and Hall, C. R. L., "Thermochemistry of Propellent Explosives," *Journal of Physical and Colloid Chemistry*, vol. 51, 1947, pp. 593–596.

Calculation of a Mollier Diagram

(Continued from page 570)

and of entropy versus temperature and pressure are to be combined into a plot of enthalpy versus entropy with lines of constant temperature (isotherms) and lines of constant pressure (isobars) and lines of constant volume (isochores).

To construct the main isotherms and isobars, the coordinates (h,s) of their intersections were found from the h-t table and the s-t table and plotted. Intermediate temperature steps of 10 C were interpolated linearly along the isobars.

The entropy coordinates for the intermediate isobars were interpolated in logarithmic proportions along isotherms as shown in Equation [8]. In supersaturated region, only isobars are drawn as the isotherms very nearly coincide with them as mentioned previously.

In the superheated region, a closed formula was derived relating the total pressure and the specific volume.

For steam, (6) offers the formula

$$v = \frac{47.06\ T}{P} - \frac{0.9172}{(T/100)^{2.82}} - P^2\,\frac{1.3088\cdot 10^{-4}}{(T/100)^{14}} + \frac{4.379\cdot 10^{7}}{(T/100)^{31.6}} \quad \ldots [15]$$

which is valid down to saturation pressure if $t > 300$ C.

For each temperature, we obtain an equation of the form

$$(v_{H_2O})_P = \frac{A}{P} - B - CP^2 [\mathrm{m^3/kg}] \ldots\ldots\ldots\ldots [16]$$

The specific volume of O_2 at the *total* pressure and at a given temperature is represented

$$(v_{O_2})_P = \frac{26.496\cdot T}{P\cdot 10^4} = \frac{D}{P} \ldots\ldots\ldots\ldots [17]$$

where A, B, C, D are constants at constant temperature. The specific volume of the mixture is composed

$$v = a_{H_2O}\ (v_{H_2O})_P + a_{O_2}\cdot (v_{O_2})_P \ldots\ldots\ldots\ldots [18]$$

We substitute $(v_{H_2O})_P$ and $(v_{O_2})_P$ and arrange

$$P^3 + \frac{a_{H_2O}\ B + v}{a_{H_2O}\cdot C}\ P - \frac{a_{H_2O}\ A + a_{O_2}\ D}{a_{H_2O}\cdot C} = 0 \ldots\ldots [19]$$

The equation was solved for P in steps of 50 C, inserting chosen values of v. This was done by machine calculation.

The entropy coordinates for these pressures were interpolated between two pressures on the isotherm in logarithmic proportions.

Acknowledgment

The assistance of Ken Brown, John Luckhowec, and Tully Myers in calculating data and designing the diagram is gratefully acknowledged.

References

1 Heller, G., Leber, H., and Luft, N., "Untersuchungen an T-Stoff; Erzeugung von Druckgas aus T-Stoff und dessen Technische Bedeutung," *Peenemunde Archiv*, 110/36, Sept. 1, 1944.

2 Beeton, A. B. P., "A Total Heat-Entropy Diagram for H_2O_2 Decomposition Products," Royal Aircraft Establishment, Farnborough, Hants., August 1947.

3 Schmidt, E., "Technische Thermodynamik," J. Springer, Berlin, 1944, Dampftabellen.

4 Keenan and Keyes, "Thermodynamic Properties of Steam," John Wiley and Sons, New York, 1945.

5 Justi, E., "Spezifische Wärme, Enthalpie und Dissoziation Technischer Gase," Edwards Bros., Inc., Ann Arbor, Mich.; reprint from J. Springer, Berlin, 1938.

6 Koch, We., "VDI-Wasserdampftafeln," Munchen, 1937; quoted from D'Ans, J., and Lax, E., "Taschenbuch für Chemiker und Physiker, Springer-Verlag, Berlin, 1949, p. 1064.

Comments on Hsue-shen Tsien Paper

(Continued from page 564)

is required if a nuclear resonance level exists in the compound nucleus near the energy of the colliding particles. See H. Bethe[2] for the more complete theory of thermonuclear reactions.

According to [46] the energy production per unit volume is not excessive. In the sun, energy-producing reactions are contained, give only 10^{-4} watts/cm^3, and are self-sustaining. But in spite of the high temperatures and moderate energy output in the chamber, I am not convinced that a case is made for the possibility of a thermonuclear furnace without other and more elaborate features for containing the reaction volume to a very small fraction of the chamber volume. In the sun, gas convection and radiation transport the energy through a temperature gradient of 10^{-2} K/cm; in the furnace, the gradient must average 10^4 K/cm. If the gradient of temperature is too steep the reaction stops, and if too slow the walls evaporate. The stellar reaction is automatically self-regulated, since gravitational contraction heats the gas, and containment in a solid chamber is not a problem. The particular feature of Dr. Tsien's calculation that can be directly tested astrophysically is his device for stopping the fast reaction products of [36, 37], ${}_1H^3$, ${}_1H^1$, ${}_2He^3$; the neutrons cannot be prevented from escaping. His suggestion is to introduce a heavy and only partially ionized atom to increase the collision cross section with energetic particles of ionized hydrogen, deuterium, and helium. Intuitively, however, it is difficult to imagine a process, or particle, which moderates other particles by collision and which will not, at high temperatures, produce radiation, and therefore introduce another quenching factor. If the ions were present in sufficient numbers to produce equilibrium between kinetic energy and radiation, the black body temperature would be attained, i.e., 10^8 K; if the integrated total opacity through the gas is t (the optical thickness), the wall temperature $T(R)$ at wall radius R is obtained from the gas temperature $T(r)$, reaction zone radius r, as

$$T(R) = T(r)\cdot (r/R)^{1/2}\, t^{1/4}$$

Since $T(R)/T(r)$ must be less than 10^{-5} to prevent the walls from evaporating, and since $(r/R)^{1/2}$ cannot be much less than 10^{-1}, the optical thickness t must be less than 10^{-16}, which is extremely low for any real ionized gas. Therefore, the problem mentioned following [56] is a difficult one, as yet unsolved. New technical methods are required for isolating a hot gas volume by material in which a steep temperature gradient exists, and which will not radiate. It should be remembered that at high temperatures radiative transfer usually surpasses convective or conductive transfer.

[2] Bethe, H., *Physical Review*, vol. 55, 1939, p. 434.

Technical Notes

Continued Investigations of the Opposing Jet Flameholder

ALLAN SCHAFFER[1] and ALI BULENT CAMBEL[2]

Gas Dynamics Laboratory
Northwestern University, Evanston, Ill.

A previous publication by the authors concerning the opposing jet flameholder was preliminary in nature. In this note, selected additional data are presented. Hypotheses concerning the mechanism of stabilization are discussed briefly and investigations now in progress are mentioned.

Introduction

IN RECENT times, studies of flameholding elements other than physical bodies have received considerable attention for several reasons. Theoretically, physical holders such as V-gutters and rods are difficult to analyze, while in practical applications they pose undesirable drag and flame-spreading problems. One different type of flameholder is the opposing gaseous jet, which was described in a preliminary paper (1)[3] by the authors. Since the writing of that paper considerable data have been gathered and extended investigations are in progress at the Gas Dynamics Laboratory of Northwestern University.

Before any additional data are presented, the observations in (1) will be reviewed briefly. There the opposing jet was described as a high velocity gaseous stream discharging in a direction 180 deg to the primary flow. A metal tube of about $^1/_{16}$-in. ID was used for the jet, and supply pressures to the tube were in the vicinity of 100 psig so that the flow was choked. The mass flow rate through the tube was generally less than 1 per cent of the primary mass flow rate. The flame anchored itself about 1 to 3 in. upstream from the end of the metal tube, and flame spreading was satisfactory. Normally, the jet medium was air, although tests with oxygen and nitrogen were also attempted. An opposing air jet stabilized premixed propane-air flames having approach velocities of several hundred fps when the mixture was at atmospheric pressure and was not preheated. Indications were that the performance curve would peak on the rich side. It was observed that a flame could not be stabilized with a pure nitrogen jet. The proposed interpretation was that a critical zone existed in the stagnation region at the upstream tip of the flame and that conditions in this zone determined the stabilization. It was suggested that the performance curve for an air jet might be shifted toward the lean side by making the critical zone richer; that is, by mixing small quantities of fuel with the jet air. Furthermore, it was predicted that higher jet flow rates might result in better flameholder performance.

Selected Additional Data

One purpose of this note is to present some additional data so that a more complete understanding of the properties and potentialities of the opposing jet will be available. Fig. 1 shows flame blowoff data for two different opposing jets; namely, for a pure air jet and for a stoichiometric jet of propane and air. The apparatus and the operating conditions are the same as in (1) except that the jet supply pressure is 70 psig

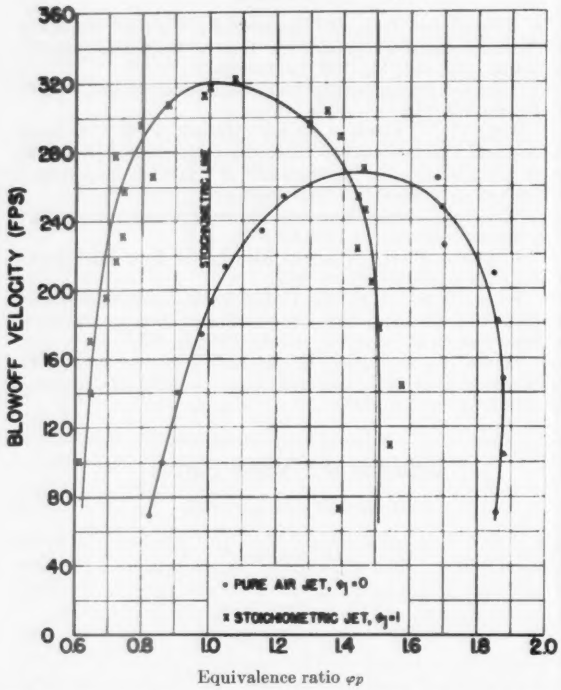


Fig. 1. Blowoff curves for a pure air jet and for a stoichiometric jet. Tube 0.059 in. ID; jet supply pressure 70 psig

instead of 100 psig. Furthermore, the jet tube length is shorter; namely, 4 in. as compared to 18 in. before. The figure shows that as the jet is made richer the blowout curve shifts toward the lean side; that is, toward lower values of the equivalence ratio of the approach stream. Tests with still richer jets, not shown here, have substantiated this observation. The increment of fuel flow necessary to change the jet equivalence ratio by unity is only about 1 per cent of the primary fuel flow. This minute quantity of fuel mixed into the jet causes a relatively large shift in the blowout curve. It is difficult to imagine a small quantity of fuel having such an effect in a premixed stabilized flame unless the fuel feeds into a zone of special importance to the stabilization. Therefore the term critical zone has been employed.

There are several other interesting observations concerning Fig. 1, but these can be discussed to better advantage after a model for the stabilization mechanism has been presented. The model that is being employed follows the concept that a small pilot reactor, or critical zone, exists in the low velocity stagnation region at the nose of the flame. As shown in Fig. 2, there are three streams feeding into the critical zone: the jet media (m_j), the recirculated media that is entrained by the free jet (m_r), and the unburned primary mixture that penetrates directly into the zone from upstream (m_p). Initially the analysis assumes instantaneous mixing of these three streams, and their proportions and compositions determine the equivalence ratio in the critical zone. It seems fair to assume that a criterion for stability is the energy level in the critical zone. The burden for maintaining this energy level falls upon the recirculated media. Thus sufficient burned gases must be entrained by the jet. It has been shown experimentally that recirculation is necessary for the jet to function as a stabilizer. One striking demonstration of the extent of the recirculation patterns is that successful light-off has been

Received March 5, 1956.

[1] Research Fellow, General Motors Corp., Department of Mechanical Engineering. Stud. Mem. ARS.

[2] Associate Professor of Mechanical Engineering. Fellow Mem. ARS.

[3] Numbers in parentheses indicate References at end of paper.

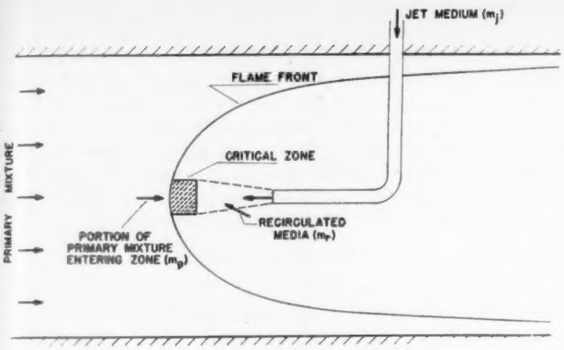


Fig. 2. Model for the stabilization mechanism

accomplished with the spark plug 5 in. downstream from the end of the jet tube.

Returning to Fig. 1, we note that for a stoichiometric jet the performance curve peaks at a primary equivalence ratio of unity. Thus for blowout at the peak of this curve, two of the three streams feeding into the critical zone have eqivalence ratios of unity. The third stream is the recirculated media, the composition of which can be assumed to be approximately that of the equilibrium products of combustion for the equivalence ratio of the primary stream. For the condition under consideration, then, the above assumption dictates that the recirculated media be inert. When these three streams are mixed in the critical zone, the result is that the equivalence ratio in the critical zone at the maximum approach velocity is unity. This result could have been predicted a priori by applying to the critical zone knowledge of the functional relationship between reaction rates and equivalence ratio. Furthermore, it seems logical to assume that for any jet mixture strength the equivalence ratio in the critical zone is always unity at the maximum approach velocity. This observation enables us to perform a calculation to determine the relative contributions of the primary stream and the jet stream to the critical zone. In order to perform a simplified calculation it will be necessary to assume that the recirculated media is inert even when the primary mixture is not stoichiometric. This assumption probably introduces only a small error into the calculations. The expression for the equivalence ratio in the critical zone, φ_c, is expressed by

$$\varphi_c = \frac{\sum \text{rates of fuel flow into zone}}{\text{stoichiometric fuel-air ratio in zone} \times \sum \text{rates of air flow into zone}} \quad \ldots\ldots\ldots\ldots\ldots [1]$$

The inert recirculated media affects the reaction rate in the critical zone but not the equivalence ratio there. Consequently, we can write

$$\varphi_c = \frac{m_p\left(\dfrac{F_s\varphi_p}{1 + F_s\varphi_p}\right) + m_j\left(\dfrac{F_s\varphi_j}{1 + F_s\varphi_j}\right)}{\left[m_p\left(\dfrac{1}{1 + F_s\varphi_p}\right) + m_j\left(\dfrac{1}{1 + F_s\varphi_j}\right)\right]F_s} \quad \ldots\ldots [2]$$

where

φ_c = equivalence ratio in the critical zone
m_p = mass rate of flow of the primary mixture into the critical zone
m_j = jet mass flow rate (all of which is assumed to enter the critical zone)
φ_p = equivalence ratio of the primary mixture
φ_j = equivalence ratio of the jet
F_s = stoichiometric fuel-air ratio for the fuel

When we apply Equation [2] to the peak of the curve for the pure air jet, we substitute $\varphi_c = 1$, $\varphi_p = 1.45$, $\varphi_j = 0$, $F_s = 0.0641$, and obtain

$$\frac{m_p}{m_j} = 2.44 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots [3]$$

Thus the primary stream contributes 2.44 times as much mass to the critical zone as does the jet. It should be pointed out that the computations are valid only for the given jet size at an approach velocity of 270 fps. However, Equation [3] can be used with little error for other jet mixture strengths. If we measure the total mass flow rates of the jet medium and of the primary mixture, we can use Equation [3] to determine the per cent of the primary mixture that enters the critical zone. The value computed in this manner is about $1^1/_2$ per cent and shows that the critical zone is indeed very small. The preceding computations have also been made with satisfactory results for the data from a jet having an equivalence ratio of 2.

Some information concerning practical applications is available from Fig. 1. Normally afterburners operate with a stoichiometric approach mixture; consequently, it is desirable for the blowout curve of the flameholder to peak at an equivalence ratio of unity. Fig. 1 shows that an opposing jet having itself an equivalence ratio of unity would be required. Therefore, it is probable that investigations as to the practical applications of opposing jets will be concerned principally with stoichiometric opposing jets. Richer jets might be used for light-off; they would also be well suited for modulation when the primary mixture is lean. If, because of its greater simplicity, a pure air jet is employed instead of a stoichiometric jet for an afterburner application in which the approach mixture is stoichiometric, Fig. 1 shows that the maximum approach velocity attainable would be decreased by about 40 per cent.

One aspect of Fig. 1 that is not so easily explained is the fact that the curve for the stoichiometric jet has a higher maximum velocity than does the curve for the pure air jet. An examination of Fig. 3 may provide a partial explanation

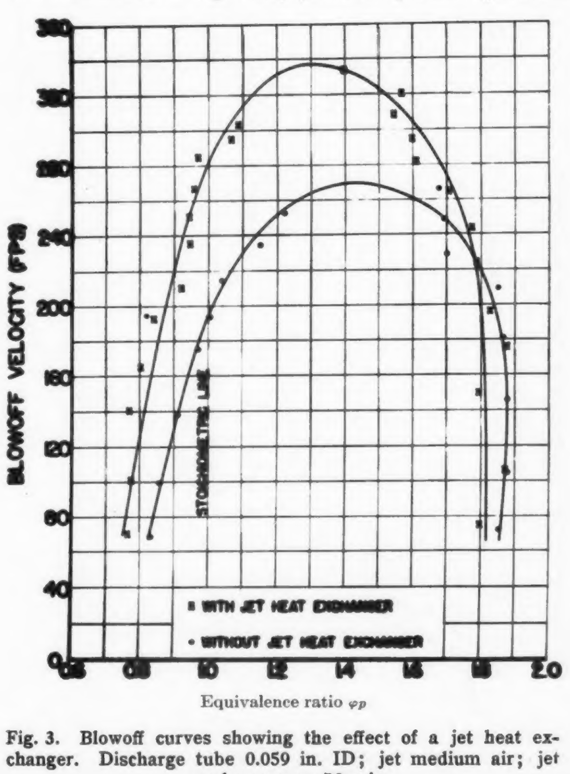


Fig. 3. Blowoff curves showing the effect of a jet heat exchanger. Discharge tube 0.059 in. ID; jet medium air; jet supply pressure 70 psig

for this behavior. Fig. 3 indicates the beneficial effect of preheating the jet medium, which was air for these tests. The lower curve is for the short jet tube utilized in most of the tests recorded in this note. The tube is $^1/_8$-in. OD × 0.059-in. ID × 4-in. length exposed to flame. The upper curve is for a long tube such as was used in (1). For this latter test the jet air was passed through a $^1/_4$-in. tubing heat exchanger in contact with the flame and then was fed to the $^1/_8$-in. tube previously described. The figure shows that heating the jet medium aids the stabilization. On the rich side the two curves are drawn as separate lines, but the data scatter is such that they could have been justifiably drawn as a single line. Apparently with rich mixtures a high jet temperature is obtained for the short tube alone and the heat exchanger does little good. The effect of heating the jet medium, while pronounced, is not tremendous because the temperature in the critical zone is influenced primarily by the hot recirculated gases. A comparison of Figs. 1 and 3 suggests that a thermal effect may be responsible for the higher maximum velocity obtained for the stoichiometric jet in Fig. 1. This thermal effect may be the burning that takes place along the boundary of the free jet. The term free jet is defined here as the portion of the jet stream from the end of the tube to the critical zone. Burning is observed to take place along the boundary of the free jet either when the jet medium is a fuel-air mixture or when the medium is pure air and the primary stream is rich. This boundary burning may act like incremental heat addition in aiding the stabilization. Since boundary burning exists at the peak approach velocities for a stoichiometric jet and not for a pure air jet, this burning may explain the higher approach velocities with the stoichiometric jet. However, these higher velocities might also be explained by mixing phenomena in the critical zone. Morever, beneficial effects of boundary burning may be responsible for the near vertical slope of the rich side of the curve for the pure air jet, although any inference drawn from rich data is open to question because of the inherent rough burning that accompanies rich mixtures.

Fig. 4 is a typical curve taken from the work of Edward Pohlmann (2), who studied among other things the effects of varying the jet diameter and the mass flow rate. The figure presented here gives a family of performance curves for various supply pressures of pure air to a short jet tube of 0.033-in. ID. Supply pressures to the tube are labeled on the graph. Only the top portions of the curves are given. It is seen that increasing the jet supply pressure, and thus the mass flow rate and momentum, makes possible higher maximum velocities. It can be expected that higher maximum velocities will be accompanied by wider ranges of equivalence ratio.

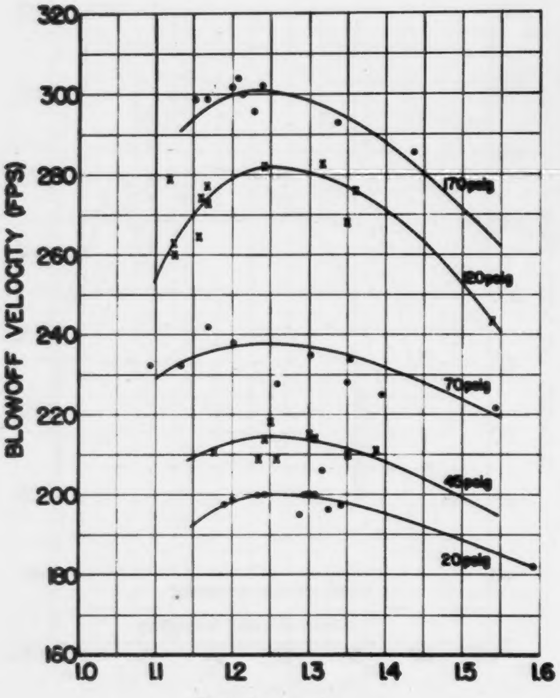


Fig. 4. Tops of blowoff curves at various jet supply pressures for an opposing air jet having a tube 0.033 in. ID

Acknowledgments

The authors extend their special thanks to Edward Pohlmann for the use of the data depicted in Fig. 4. The studies described in this note were sponsored by the Department of Mechanical Engineering and were made possible by a fellowship grant of the General Motors Corporation as well as by the financial support of Faculty Research Projects 103-54, 103-55, the Technological Institute, Northwestern University.

References

1 Schaffer, A., and Cambel, Ali Bulent, "The Effect of an Opposing Jet on Flame Stability," Jet Propulsion, vol. 25, June 1955, pp. 284–287.

2 Pohlmann, Edward, "Observations on the Opposing Jet Flame Stabilizer," Internal Report, Gas Dynamics Laboratory, Northwestern University, October 1955.

Jet Propulsion News

Alfred J. Zaehringer, American Rocket Company, *Associate Editor*
Norman L. Baker, Indiana Technical College, *Contributor*

MORE ON PROJECT VANGUARD

WITH the addition of recently released details, the picture of the Vanguard vehicle is now almost complete. It will be 72 ft long and have a maximum diameter of 45 in. Gross weight will be 11 tons. Second stage will carry all guidance: three-axis gyro reference system, pitch programmer, and velocity sensors. Guidance system will orient rocket to horizontal flight; stability will come from spin along longitudinal axis.

The planned orbit of 300 miles may not be reached because of errors in launching and guidance. The orbit will be elliptical: perigee, 150 miles; apogee, 1500 miles. Some satellites may carry no payload. Launching of the first satellite is slated for early 1958.

Four new subcontractors for Vanguard have been announced. Allegany Ballistics Laboratory (Cumberland, Md.) and Grand Central Rocket Co. (Redlands, Calif.) will design and develop a new solid propellant rocket for the third stage. Presumably the ABL model will use double-base propellant while Grand Central will furnish a composite variety. The Minneapolis-Honeywell Regulator Co. (Minneapolis, Minn.) will design and build a three-axis reference system which consists of gyros that indicate roll, pitch, and yaw. Vickers Electric (St. Louis, Mo.) will design and make the magnetic amplifier autopilot which will control the flight. The autopilot will take its instructions from the gyro system and will keep the vehicle on course by moving the gimbal-mounted rocket engine.

Naval Research Laboratory has developed the "Minitrack" radio angle tracking system for the satellite. The satellite will have a miniature transmitter (108 mc) with an output of 10–50 mw operating on silver-zinc batteries. Satellite signal will be received and tracked by ground stations. Data from ground stations will be fed to a computing facility to determine the exact orbit. Minitrack, weighing about 2–3 lb, may also telemeter data from satellite. Ground turn-on will allow telemeter transmission when the satellite is over a ground station.

BALLISTIC MISSILES

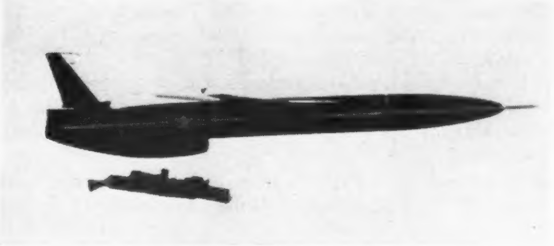
● Titan, the second USAF intercontinental missile, will be developed by Martin at Denver. It will be a two-stage rocket.

● Atlas will be produced at Sorrento (Calif.) by Convair. Facilities contracts for the missile were awarded as follows: AVCO (Stratford, Conn.), $1,425,000; Burroughs Corp. (Detroit), $400,000; General Electric (Syracuse), $861,000; Sperry-Rand (St. Paul), $155,000; Western Electric (New York), $500,000; North American Aviation (Los Angeles), $6,463,000; Air Products (Allentown, Pa.), $5,768,000.

Burroughs Corp., developing a computer system for the missile, reports that the Atlas will be guided while under power. The missile will be tracked by radar and the tracking data fed into a computer. The computer will compare this data with correct trajectory, make corrections in missile's flight path whenever it deviates from the established course.

● Thor, a single-stage IRBM, is being developed by Douglas Aircraft for USAF. Subcontractors are General Electric (warhead), North American Aviation (rocket engine), and AC Sparkplug (guidance).

● Jupiter, a ship-launched rocket, is the new Chrysler-Army-Navy IRBM. Development will begin under a $15 million allocation by the Navy for 1957, pending an additional $72 million contract for actual production.



SNARK SM-62: Speed is a big questionmark

● Activation of the first unit to fire the Redstone missile was announced by the Secretary of the Army. Formed at Redstone Arsenal, the unit will be designated the 217th Field Artillery Missile Battallion (Redstone).

CRUISE MISSILES

● Status of Snark (photo) is still undecided. Although the Northrop SM-62 has intercontinental range and could carry a nuclear warhead, it is a subsonic (about Mach 0.9) cruise missile. Other specifications: length about 60 ft; span about 50 ft; diameter about 5 ft. The missile recently made a 2000-mile test flight at Patrick AFB (Fla.)

● Navaho SM-104A (formerly SM-64) ramjet, now undergoing flight tests at Patrick AFB (Fla.), will be produced by North American under a $5,325,000 government contract.

● Launching dollies for carrier launching of the Regulus are jettisoned after each launch according to Chance Vought. The three-wheel cart, made of tubing, weighs $^1/_{20}$ of the old launching platform and RATO bottles. In launching, the dolly is hooked to the carrier's steam catapult system. The carts are also used for stowing and handling the missiles aboard.

● The guided-missile submarine SSG will become the nuclear-powered, guided-missile submarine SSGN. Two conventional attack submarines Grayback (SS-574) and Growler (SS-577) now under construction will be completed as guided missile submarines. All three subs will be capable of launching the Regulus.

GROUND-TO-AIR MISSILES

● The U. S. Army is sponsoring the development of an antimissile missile by Cornell Aeronautical Lab.

● Talos surface-to-air missile will be used by the Continental Air Defense Command to protect U.S.A.F. bases. Developed by the Navy and Bendix, Talos will also be used aboard Navy ships.

● Coordination of Nike batteries will be the job of the new Missile Master (MM) System developed by Martin and the Army. MM is a complete electronic system for coordinating and directing a large number of Nike batteries. The system collects information on the identity and location of aircraft and presents this information on electronic displays. The data are then distributed to firing batteries. Each MM is housed in a large two-story building (Antiaircraft Operations Center) where radar data gives an over-all view of the air situation. Tracking operators monitor early warning information; tactical controllers evaluate progress of an engagement and assign targets; friendly protectors insure that Nike batteries do not fire on known friendly aircraft; battery

commanders select or receive target assignments without conflicting with or duplicating the actions of other batteries. MM can operate in conjunction with the Air Force SAGE system and also can be used with future missile systems. Other contractors on MM were Airborne Instruments Lab and the American Machine & Foundry Co.

● To further increase its effectiveness, a new version of the Nike may carry a nuclear warhead. The warhead, says the Army, would enable one missile to destroy an entire attacking air fleet.

Eventually some Nike batteries will be manned by National Guard units when sufficient missiles are available to replace all conventional guns. Newest site for Nike battery: Okinawa.

● Additional Terrier details have been made known: total length, 27 ft; booster length (solid propellant), 14 ft; sustainer rocket (also solid), 13 ft; booster diameter, 8 in. Booster burns for about 4 sec giving a speed of Mach 2. Missile proper carries a proximity fuze and has a top speed of Mach 2.5. Booster carries a rating of "over 200,000 hp." Estimated cost of the Terrier is about $30,000.

In operation on the USS Boston, acquisition radar tracks 2 targets at a time. Control radar can handle 8 in-flight missiles per minute. A computer handles target tracking and fire control. The Navy reports that Terriers have intercepted a target near 50,000 ft, destroyed a jet drone flying at over 500 knots.

● Tartar missile, also by Convair, is smaller than Terrier but has a similar layout. Tartar is powered by a single-stage rocket.

GENERAL

● Thrusts greater than those of any previously existing single rockets are claimed for Phillips Petroleum Co.'s solid propellant boosters. Solid propellant of German World War II Rheintochter booster produced 143,000-lb thrust for 0.6 sec while current North American liquid propellant rocket engine for Atlas is pegged at about the 125,000–150,000-lb thrust level. Phillips' propellant uses synthetic rubber, carbon black, and ammonium nitrate.

● First U. S. rocket engine that can be throttled up or down at will was revealed by Curtiss-Wright Corp. The unit is used to power the Bell X-2 rocket plane. C-W began development during World War II under the leadership of Dr. Goddard at Caldwell (N. J.) facility which includes five test cells and a hydraulic test lab. Other rockets will be used for ATO and missile propulsion.

NEW TM-61B MATADOR

Test firings of TM-61B have been successful. The new Martin missile carries a larger nose section, a new airborne guidance system. Estimated cost is about $85,000

● Dart is an Army Ordnance AT missile. About 6 ft long, it is said to be powered by a solid propellant rocket. Control comes from wires which trail out behind the missile.

● Sparrow missile by Sperry has been operating from carrier-based aircraft in Atlantic and Pacific tests. The air-to-air missile is powered by an Aerojet-General solid propellant rocket. The Sparrow I is now in a "combat ready" status according to the Navy. Built at Bristol (Tenn.) the bird is 12 ft long and weighs 300 lb. Guided by a radar beam from the launching aircraft, Sparrow has a speed of over 1500 mph.

● Reliability of liquid rocket engines may run as high as 95–96% in future systems according to Reaction Motors engineers.

● "Portable foxholes" will be provided by a small rocket motor weighing $3^1/_2$ lb. Packed in a cardboard cannister, the rocket blasts a hole in the ground.

● Rocket experts are not immune to crystal-gazing predictions. As witness: Isothermal expansion of gases might eventually be used in an atomic reactor for rocket propulsion according to two Northwestern University scientists, Romer and Cambel. This type of gas flow could lead to smaller rocket engines of greater power. The process would require a gas whose molecules vibrate in an infinite number of ways.

According to a prediction of Simon Ramo of Ramo-Wooldridge Corp., a substantial portion of the country's air freight could be carried by guided missiles within 10 years.

Still further into the future, Krafft Ehricke of Convair stated that within 200 years the moon would be colonized by rocket flights from the earth.

FOREIGN ROCKETS

England: Fairey Fireflash may be used as armament on the Hawker Hunter. The air-to-air missile was originally scheduled for use on the Vickers Swift. A beam rider missile, it recently scored hits on target drones and will be the first British guided missile delivered to the R.A.F. Another British missile, a ground-to-air type, is going into production. For ground-to-ground use, Britain will use the U. S. Corporal missile. The ramjet Napier test missile was described by British sources as having reached an altitude greater than any similar British missile. The missile measures 17–20 ft long and uses cluster-type solid propellant booster rockets.

Ready for launching during the IGY will be Great Britain's new high altitude solid propellant research rocket. The rocket is 25 ft long, has a diameter of 17 in., and is designed to carry instruments to an altitude of over 100 miles. The rocket is launched from an adjustable tower 81 ft high and weighing 35 tons. Meanwhile, Britain's Ministry of Supply has established an 8000-acre test center near Scotland for development of an ICBM. But, claim the English, they are about 2–4 years behind the U. S. in missile development.

Germany: Daimler-Benz has reported satisfactory tests on its new ramjet engine designed for helicopter rotor blade propulsion. Thrust of the 7-in. diam engine is about 60 lb. Fuel consumption of the motor is about 8.4 lb/min.

A group of German engineers plan to fire a three-stage rocket during the IGY. Expected altitude of the rocket is about 60,000 ft. The group has already fired 20 rockets since 1954. Launching site will be near Cuxhaven on the North Sea.

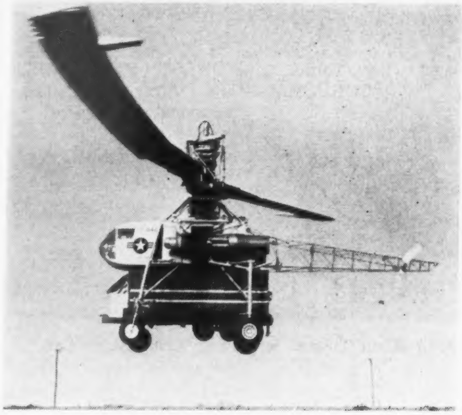
Sweden: Sweden is placing a supersonic AA missile in operation. Built by the Swedish Air Force, the Mach 3 missile is two-staged. Sweden is currently spending about a million dollars each for missile development and procurement.

Russia: Soviet Air Force Commander-in-Chief Marshall Pavel Zhigarev hints that top priority is being given to the ICBM (Red designation, SIG). In his policy-making book, "Thoughts on Air Strategy," published last year, Zhigarev

Jet Helicopters Pass in Review

MARINE HRS uses ROR (Rocket on Rotor) to boost lift power, increase safety factor

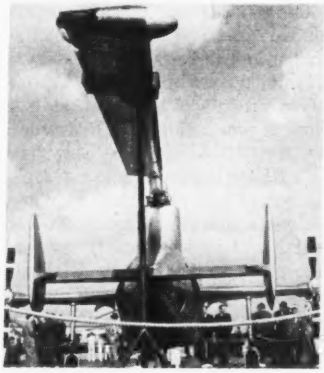
FLYING IN FORMATION, Hiller HOE-1's go through their paces before joining the Fleet. Powered by two Hiller ramjets, craft cruise at 60 knots



WORLD'S BIGGEST helicopter, Hughes Aircraft turbojet XH-17, can carry 10-ton payload

ONE-MAN HELICOPTERS, Kellett Aircraft's "Stable Mable" (left) and Rotorcraft's "Project Pinwheel" (right) both use RMI peroxide rocket motors

HELICOPTER HYBRID, McDonnell's XV-1, uses conventional pusher props for horizontal flight, pressure jet rotors for vertical flight. Piston engine supplies air for jet units

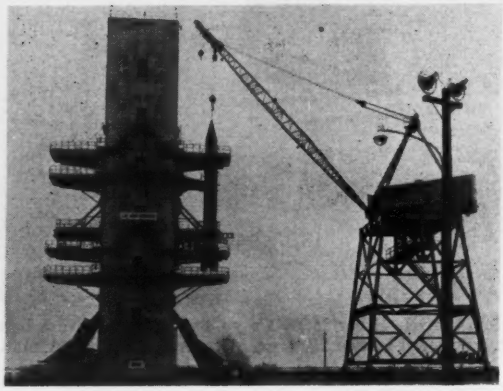


STILL EXPERIMENTAL, Fairy Gyrodone is first British jet helicopter

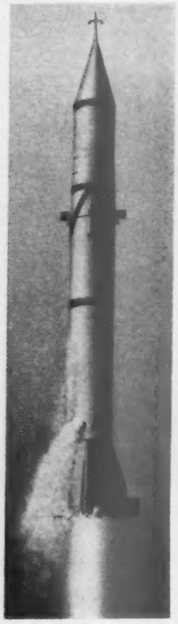
says that the SIG has made the strategic bomber obsolete. In addition to intercontinental weapons, "space weapons" were mentioned. Meanwhile, Soviet party boss Khrushchev stated that Russia would soon have guided missiles carrying an H-bomb.

Other sources report that Russia has a rocket with a range of 100–150 miles which can be launched from a submarine 300 ft under the water. The rocket is said to be able to carry a nuclear warhead. The Soviets are said to have a missile launching sub fleet of about 400. Another report says that the Reds are working on a three-stage, manned, intercontinental glider rocket.

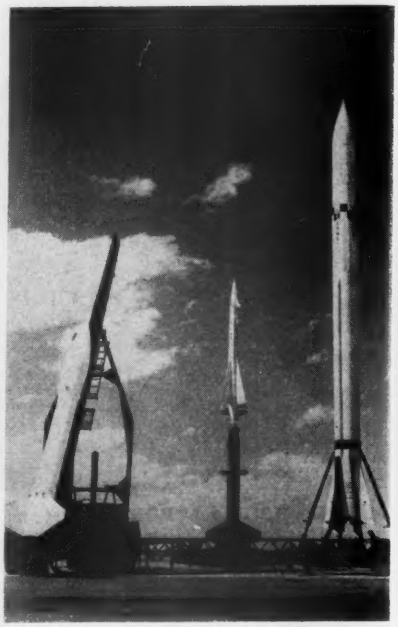
Rockets at Redstone



Gantry lowers REDSTONE missile into test stand

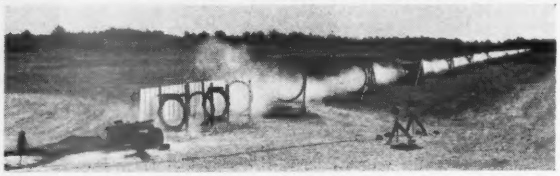


REDSTONE blasts off



Big Three. . .HONEST JOHN, NIKE, CORPORAL are Army Ordnance weapons

High Speed Wind Tunnel is part of Aerophysics Lab.



Rocket flashes through accuracy range

REDSTONE ARSENAL was established in 1941 near Huntsville by the Chemical Warfare Service. Located in northern Alabama, it comprises an area of about 40,000 acres in its 10- by 12-mile plot.

In 1948 Redstone was designated as a center for the Army Ordnance Department research and development activities pertaining to rockets and related items. In 1950 rocket activities moved here from Fort Bliss, Texas, with the formation of the Guided Missile Division. This move was made by 500 military personnel, 130 German rocket scientists, 120 General Electric Company contractor employees, and 120 Civil Service employees. In 1951, a division of Thiokol Corp. moved from Elkton, Md., to Line 1 for work on solid rocket propellants. Lines 3 and 4 were occupied by a group from Rohm & Haas Co. (Philadelphia, Pa.) in 1952, also for work in solid propellants. Improvements during this period included: \$170,000 for a Thiokol administration building; a million dollar Gorges Laboratory for Rohm & Haas; and a \$4 million construction program. The Rohm & Haas program is concerned with shoulder-fired rockets. Another industrial firm to join hands with Redstone was the Chrysler Corp. of Detroit, Mich. In 1952 Chrysler began work on developing the REDSTONE missile. Development work was done at Redstone with production at Warren, Mich., and testing split between Redstone Arsenal (static) and Patrick AFB, Fla. (dynamic). Chrysler recently joined forces with Redstone and the Navy to develop an IRBM in the 1000–1500 mile class. Three other industrial firms are also on the base but these are not connected with arsenal work.

The primary mission of Redstone is to serve as a center for research and development of guided missiles, including components and systems development in the fields of aerodynamics, guidance and control, propulsion, assembly techniques, transport, test, and launching. Work is concerned with both liquid and solid propellants. Located here is a giant new 150-ft test stand, a former Peenemuende wind tunnel, and a Guided Missile School.

The Redstone Arsenal payroll for 1954 totaled over \$33 million and arsenal strength included over 7000 military and civilian personnel (excluding contractors such as Thiokol, Rohm & Haas, and Chrysler). In 1954 a \$23 million expansion project was begun. New projects included: a new building for the Ordnance Guided Missile School; a \$3.67 million engineering building; and a \$2 million guidance and control building. With these new developments, rockets may be expected to play an increasing role in American ordnance.

ARS News

MISSILES CHIEF Eger V. Murphree, in his first major address since taking public office, tells AMERICAN ROCKET SOCIETY that time is only block to U. S. missile progress

ARS SEMI-ANNUAL MEETING

Cleveland Conclave Draws Over 300

An estimated 337 engineers, scientists, and students from all over the country assembled at Cleveland's Hotel Statler last month for the June 18–20 Semi-Annual Meeting of the AMERICAN ROCKET SOCIETY held in conjunction with the Semi-Annual Meeting of The American Society of Mechanical Engineers.

The showing of the ARS, by far the younger of the two societies, surprised many of the long-time ARS members who recalled the not-too-distant past when a small conference room and a single banquet table usually sufficed for such meetings.

Host for this meeting was the Cleveland-Akron Section which went all out to make its guests welcome.* Despite hot and humid weather at the beginning and the omnipresent hand of security throughout (responsible for the withdrawal of two papers), the meeting was carried off with a high degree of polish. Here are some of the highlights:

Ramjets: Marcel Piry of Fairchild Engine and Airplane Corp. got the session underway with René Leduc's paper (297-56), "Early Work and Latest Realizations With Ram-Jet Engines." (Dr. Leduc was unable to present his own paper because of recent illness.)

Looking forward to the "near future" when men will fly at Mach 2 without too much difficulty, Dr. Leduc sees ramjet engines as standard powerplants of future aircraft. Backing this vision, of course, is his long experience—dating back to the early 'thirties—in the ramjet field.

Of even greater significance, perhaps, is the fact that Dr. Leduc has had ramjet aircraft under actual flight tests since 1949. His latest prototype, the 021 now undergoing flight tests near Istres, is still subsonic. But, says Dr. Leduc, it is the last subsonic ramjet he will build. The next will be a truly supersonic airplane.

● Albert Gail of Cornell Aeronautical Lab spoke next on "The Ramprop—A Supersonic Jet-Driven Propeller" (296-56). Essentially a 120-ft-long ramjet, the Ramprop, as envisioned by Mr. Gail, in an upright position would act as a rotor to lift or lower an airplane vertically, then convert to a horizontal position for forward flight. Based on his predicted performance characteristics, he believes the Ramprop would be particularly suitable for aircraft weighing 150,000 lb or more. Use of such a unit, he feels, could, among other things, increase payload capacity 10,000 lb or more, up speed to almost sonic level while matching current fuel economies.

At one time, Office of Naval Research was interested in the Ramprop idea. Now, however, there is practically no interest in the subject, said Mr. Gail.

● Paper 298-56, "Some Fundamental Aspects of Ramjet Propulsion" by Arthur N. Thomas, Jr., of Marquardt Aircraft Co., was a clearance casualty.

Liquid Propellant Rockets: The first paper in the afternoon, "Dynamics of a Pump-Fed, Variable-Thrust, Bi-Propellant, Liquid Rocket Engine System" (299-56), was a joint effort by Marvin R. Gore and John J. Carroll of Aerojet-General Corp. Aimed primarily at those interested in control design, this paper established the principal dynamics of a bi-propellant engine over a broad thrust range by analog computer simulation of the nonlinear physical elements, then went on to analyze the performance of the rocket engine with typical controllers.

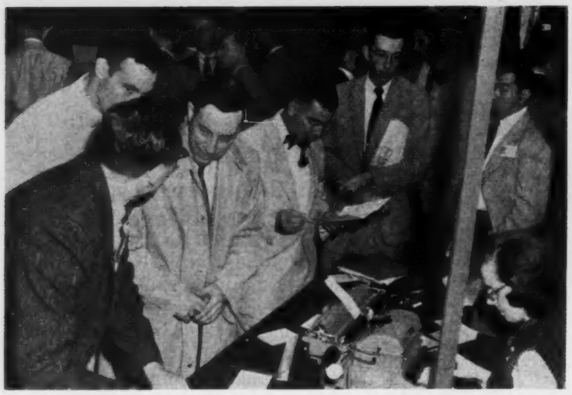
● The next paper, "A Solid-Liquid Rocket Propellant System" (301-56), was also a joint effort. Co-authors were George E. Moore and Kurt Berman of General Electric. Dr. Moore presented the paper in which was described a self-igniting hybrid rocket propellant system employing 90% hydrogen peroxide as the oxidizer and polyethylene as the fuel. Dr. Moore reviewed the reasoning leading to interest in such a system and discussed briefly some of the project findings.

● Getting his paper (302-56) through clearance too late to be preprinted, John C. Becker, Jr., of Aerojet-General finished up the first-day sessions with his interesting "Evaluation of Various Liquid Rocket Exhaust Jet Flame Suppressants." In an attempt to lessen the heat of jet flames—and at the same time by-pass complicated, heavy, expensive cooling systems, Mr. Becker tried four chemical additives as flame suppressants. Potassium nitrite proved best (the others: liquid bromine, potassium nitrate, sodium nitrite), made a major reduction in the heat of jet flames. Why this project was apparently dropped was not made clear.

Time Limit: Climaxing first-day activities was the ARS Banquet held Monday evening. Toastmaster Walter T. Olson, president, Cleveland-Akron Section, introduced featured speaker Eger V. Murphree. In his first major address since taking office last April as Special Assistant to the Secretary of Defense for Guided Missiles, Mr. Murphree offered ARS members an optimistic picture of this country's guided missile program. The only limitation on (missile) progress, he declared, is the time it takes to solve technical problems.

Solid Propellant Rockets: J. F. R. Floyd, Applied Physics Lab., Johns Hopkins University, spoke first on "Launching Solid Propellant Rockets from Shipboard Installations" (311-

* While many Section members did an outstanding job, special mention should be made of the work done by Paul Ordin of NACA, arrangements chairman; James Daus of NACA, displays; and Henry Burlage, Case Institute, program chairman.



SIGNING IN, newcomers hurried through registration in order to be on time for the first morning session (ramjets) at 9:30 a.m.

THE AUDIENCES were unusually attentive at most sessions, made many notes for discussion periods that followed talk

ARS MEETING *(continued)*

56). Mr. Floyd discussed many of the problems peculiar to shipboard use of rockets; e.g., launching from a rolling platform. All such problems have been solved, he concluded; and the future will see growing naval use of solid propellant rockets.

● Joseph W. Wiggins of Thiokol Chemical Corp. talked about the "Importance of Mass Ratio and Adaptability of Case Bonded Solid Propellant Rocket Systems for Achievement of Super Velocities" (303-56). His point, that reduction of inert component weight (as contrasted to improvement of specific impulse) will result in significant improvement of rocket performance, as the author admitted, is still controversial.

● In his paper, "Cold-Forming Methods for Fabrication of Inert Rocket Components During Development" (304-56), H. R. Grant of Aerojet-General described a low-cost, cold-forming process suitable for developmental operations in both aircraft and missile work. In addition to being an economical way of obtaining quantities of parts that would be difficult (or extremely expensive) to make by other means, said Mr. Grant, the process also provides close tolerances, high degree of smoothness in the surface finish, increase in the yield strength and nominal ultimate strength.

● Paper 305-56, "Range, Burnout Velocity, and Design of Solid Propellant Rocket Ballistic Vehicles" by P. J. Blatz and R. D. Geckler of Aerojet-General, was withdrawn because of clearance problems.

Satellite Flight: Lead speaker Ernst Stuhlinger, Army Ballistic Missile Agency, discussed "Instrumentation Problems of Unmanned Satellites" (306-56). In his presentation, Dr. Stuhlinger also investigated the capabilities of satellites for scientific measurements, offered a tentative scheme for scheduling of planning for satellite instrumentation. A stringent limitation on satellite instrumentation, he pointed out, is the capability of the carrier vehicle. And presently existing missiles, if combined to multistage rockets, have satellite capabilities below 100 lb.

● S. F. Singer, University of Maryland, treated a somewhat neglected area of satellite flight in his paper, "The Effect of Meteoric Particles on a Satellite" (307-56). Dr. Singer was concerned primarily with the erosion phenomena due to impact of high velocity meteoric dust. At present, he said, scientists honestly don't know whether or not this dust is really a hazard to satellite flight. But they will have the answer in two years, perhaps.

● A new concept in space vehicles, "The Solar-Powered Space Ship" (310-56), was described by Krafft A. Ehricke of Convair. This ship, as pictured by Mr. Ehricke, would use a nonchemical, solar-powered drive and would have to be lighter ($^1/_{100}$ to $^1/_{1000}$ lb sq ft) than anything yet designed. Such a vehicle, he admits, goes well beyond the present concept of man-made satellites and is aimed more for the post-satellite, space travel era. This type ship, he said, is designed to relieve the logistics problem of space travel.

● "Satellite Communication Problems" was the subject of the last paper (309-56), by Jorgen Jensen, The Glenn L. Martin Co. The first question that comes to mind, said the author, is probably the limiting range of a satellite communication system. But range is no particular problem, he concluded; the most serious problems will be equipment reliability and generation of auxiliary power.

● "Lifetime of Artificial Satellites of the Earth" (308-56) by Irvine G. Henry of Aerojet-General was not completed in time for presentation.

Wind-up: Wednesday afternoon, ARS members rode out to the Lewis Flight Propulsion Laboratory of the NACA. Here, after a brief welcome by Abe Silverstein, associate director of Lewis Laboratory, visitors split into four groups, made a three-hour tour of the facility. High spot of the tour was a 20-minute look at NACA's recently opened, "10-by-10" supersonic (up to Mach 3.5), wind tunnel. This visit officially ended the Cleveland Meeting.

INFORMAL GET-TOGETHERS in lobby were common during meeting breaks, gave listeners a chance to go over some of the subjects presented by speakers at sessions

Fletcher Pratt Dies

Fletcher Pratt, a founder of the American Rocket Society, died June 10 of cancer in Monmouth Memorial Hospital, Long Branch, N. J. He was 59 years old.

A well-known writer, scholar, and military expert, Mr. Pratt gained his greatest prominence as a writer on military and naval subjects. For the first issue of the *Bulletin,* the Society's original publication and forerunner of JET PROPULSION, Mr. Pratt contributed a summary of a paper on "The Historical Background of Interplanetary Travel" (JET PROPULSION, Nov. 1955, p. 588).

Born near Buffalo, N. Y., Mr. Pratt was living in Highlands, N. J., at the time of his death. Surviving are his wife, Mrs. Inga Stephens Pratt, and a brother, Robert H. Pratt of Washington.

Detroit Honors Keller, Elects Williams

On May 28, ARS National Awards Chairman John Cowen (left) presented K. T. Keller, former board chairman of Chrysler Corp., with a citation for his distinguished service as guided missiles program director for Dept. of Defense from 1950 to 1953. Other meeting highlights were a talk by Lovell Lawrence, Jr. (below, left), Chrysler missile scientist, on the potential use of man-made stars with built-in nuclear power plants as navigational aids, and the election of Charles W. Williams (below right) of Chrysler Missile Operations as Section president.

Section Doings

Cleveland-Akron: At a regular business meeting on May 17, the Section installed the following officers and directors: Adelbert O. Tischler, president; Luiz R. Lazo,

vice-president; Howard W. Douglass, secretary-treasurer; John C. Feldscher, two-year director. Henry Burlage, Jr., continues as a director for the coming year.

Columbus. On April 26, Section members gathered at Battelle Institute, listened to William Beach, chief thermodynamicist, North American Aviation, Columbus Div., discuss several problems (and some possible solutions) associated with the thermal barrier.

The next meeting, May 24, featured a talk by Fredrick Hitchcock, specialist in aviation physiology at Ohio State Univ. Dr. Hitchcock spoke about the physiological problems associated with space flight.

Connecticut Valley: At a dinner meeting of the M.I.T. Club of Hartford, Section President Charles King, Jr., spoke about "Rockets and the ARS."

Univ. of Connecticut student branch of ARS held an organizational meeting April 18, made plans to complete the organization at the beginning of the fall term. The meeting, moderated by Section Secretary Sheldon Dolinger, featured talks on rockets and the SOCIETY by Frank Gabron and Roy Terwilliger of United Aircraft Corp.

National Capital. Mrs. Robert H. Goddard was guest of honor and first speaker at Section's May 23 dinner meeting. Mrs. Jean C. Bergaust, president of the Section's newly formed Women's Auxiliary Group, presented Mrs. Goddard with a life membership certificate in the group.

Following Mrs. Goddard's talk, ARS Board of Directors Chairman Andrew G. Haley reported on NATO guided missile meeting held in Munich last April; and the Army Ordnance space flight film, moderated by Wernher von Braun, was shown.

New York: On June 9, about 500 members of ARS and American Helicopter Society journeyed to Denville, N. J. Here, Reaction Motors, Inc., played host, provided luncheon and demonstrations of company products. Top items of interest: a new model of the rocket motor that drove the Bell X-1A to world speed and altitude records and a Marine helicopter equipped with ROR (see JET PROPULSION NEWS, p. 583).

Northern California: Leading West Coast scientists (photo) listened to Convair's Krafft A. Ehricke discuss "The Challenge of Space Flight" at a meeting held May 10 at the Engineers' Club in San Francisco. The audience also witnessed the launching of an Aerobee rocket in a film titled "Sky Is No Limit." The program—sponsored jointly by local sections of ARS, ASME, and Institute of the Aeronautical Sciences—capped the Northern California Section's recent membership drive.

Twin Cities: Pending a regular election in the fall, Section officers were appointed on an acting basis at a reorganizational meeting May 11. The appointees: president, C. C. Chang, Univ. of Minnesota Aeronautical Engineering Dept.; secretary, Thomas F. Irvine, Jr., Univ. of Minnesota Dept. of Mechanical Engineering; treasurer, Melvin Diels, Minneapolis-Honeywell Regulator Co.

Oakland Tribune

Watching a Wind Tunnel

Prior to attending the May 10 meeting of the Northern California Section, several scientists visited the new Low Density Wind Tunnel at the Univ. of California's Richmond Field Station. Taking the tour were (above, from left, standing): A. J. Eggers, Jr., president, Northern Cal. Section, ARS; George Cooper, chairman, Northern Cal. Section, Inst. of Aeronautical Sciences; Krafft A. Ehricke, Convair; F. W. Beichley, chairman, San Francisco Section, The American Society of Mechanical Engineers; (seated) Morrough P. O'Brien, dean, University of California, College of Engineering.

ARS in Munich . . .

Attending symposium on history of German guided missiles in Munich April 23–27 are ARS members Arthur P. Adamson (at top, left foreground), James J. Harford (second row, left), and J. B. Cowen (above, second row, right). Meeting was sponsored by AGARD and organized by Wissenschaftliche Gesellschaft für Luftfahrt, the German aeronautical society. Andrew G. Haley, ARS board chairman, was host at a reception for AGARD's chairman, Theodore von Kármán, during the meeting.

. . . and in Montreal

Shown with the president of Canadair Ltd., J. Geoffrey Notman (center) and the president of the Engineering Institute of Canada, R. E. Heartz (right) is ARS Executive Secretary Harford. Occasion is visit to Canadair plant during 70th meeting of EIC which was cosponsored by ARS and ASME. More than 200 engineers attended session in which Admiral F. R. Furth's paper on Project Vanguard, sponsored by ARS, was heard. Meeting took place in Montreal May 23–25.

ARS Meetings Calendar

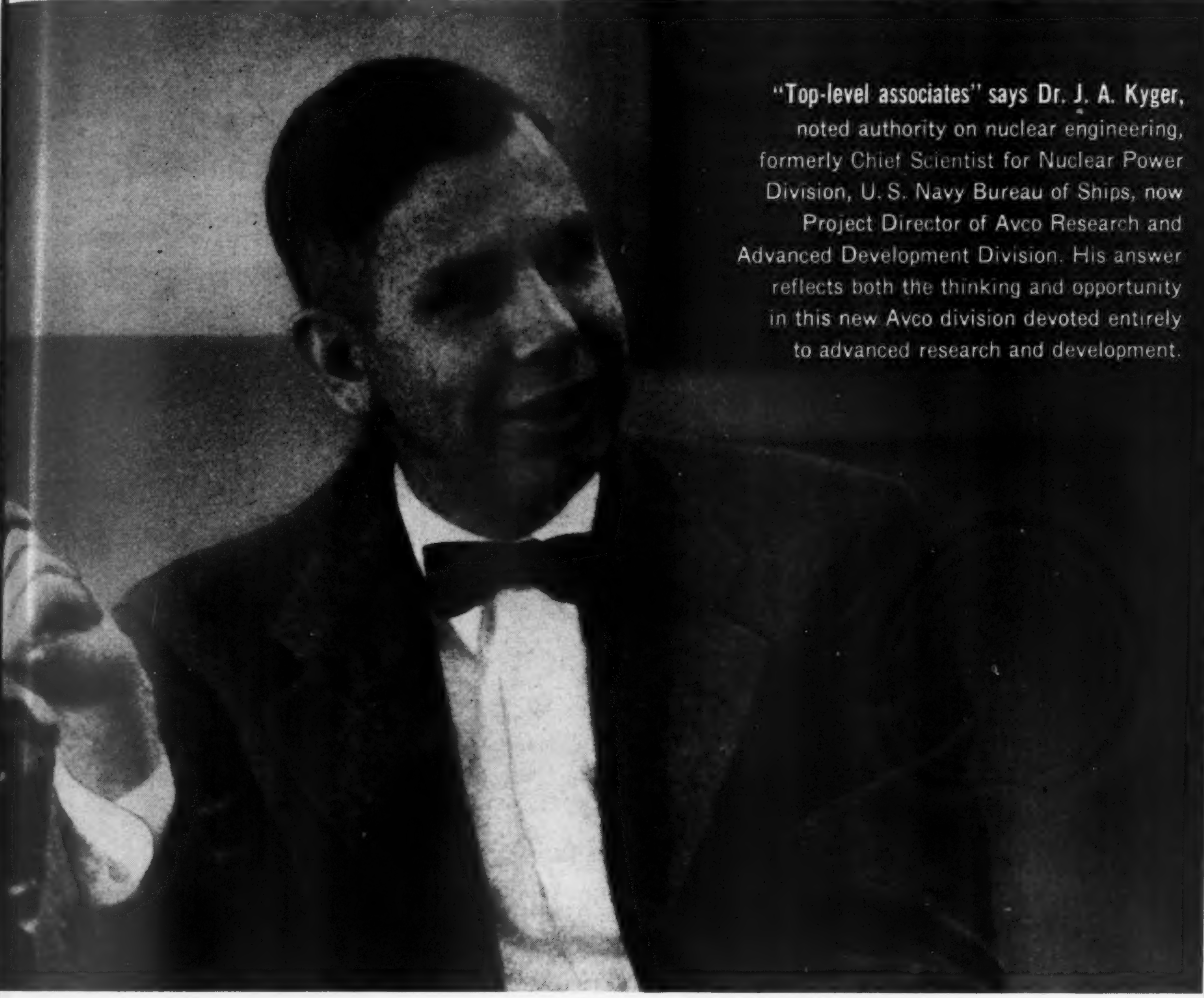
Sept. 17–21: Seventh International Astronautical Congress, Palazzo dei Congressi, Rome. Space flight.

Sept. 17–21: Annual Meeting and Exhibition, Instrument Society of America, Coliseum, New York.

Sept. 24–26: ARS Fall Meeting, Hotel Statler, Buffalo. Combustion, instrumentation, education, liquid propellants.

Nov. 25–30: ARS-ASME Annual Meeting, New York. General subjects. (Manuscripts due Aug. 27; to Andrew G. Haley, 1735 DeSales St., Washington 6, D. C.)

what helps an engineer grow?



"Freedom from routine, an atmosphere of inquiry, and provocative assignments are all important to an engineer's growth. But possibly the most important factor of all is the mental stimulation provided by able associates. It's important at all levels . . . it's essential to a young engineer."

For outstanding engineers at all levels, Avco's long-range expansion—in missiles and in all the physical sciences—offers unprecedented opportunity. *Write:* Dr. E. R. Piore, Vice-President in Charge of Research, Room 403G, Avco Research and Advanced Development Division, Stratford, Conn., or Phone Bridgeport, Conn., DRexel 8-0431.

WANTED
Leaders in the exploitation of new areas of Science

Physical Scientists
Advanced degree preferred in—Physics · Aerodynamics
Electronics · Metallurgy · Physical Chemistry · Mathematics

Engineers
Electronic · Mechanical · Aeronautical · Chemical

avco Research and Advanced Development division

avco defense and industrial products

combine the scientific skills, and production facilities of 3 great divisions of Avco Manufacturing Corp.: Research and Advanced Development; Crosley; Lycoming—which currently produce power plants, electronics, airframe components, and precision parts.

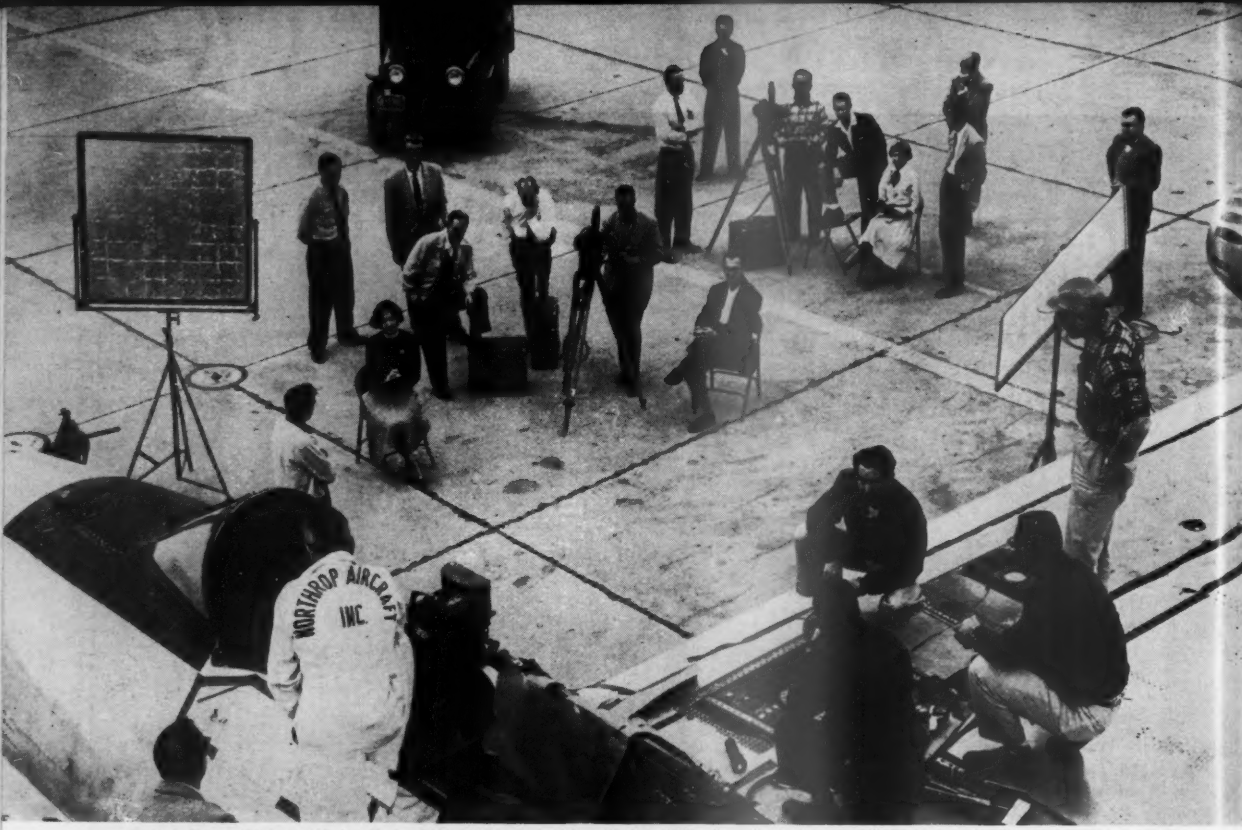
"Solar Soirée"

TOP event of the year's social season in the land of the boondocks was the First Annual Solar Soirée of the New Mexico-West Texas Section. Upon entering the BOQ at White Sands Proving Ground, where the event was held, "space travelers" exchanged tickets for planet passes, checked baggage, weighed in, and awaited flights in the cocktail lounge. Red Fuming Nitric Acid, diluted somewhat with alcohol, was reported to be the principal beverage. Flight arrival and departures were announced, and dancing took place in a star-decorated room.

Left: **Space ranger and rocket ship hostess, Mr. and Mrs. James Sims. *Right:* Mr. and Mrs. L. Gardenhire wearing prize-winning costumes**

Left to right: **Pogo-Hi: Gilbert (Pogo) Moore; Mars-Keteers: Dr. and Mrs. R. K. Sherburne; Parachute: Mrs. Gilbert Moore**

Left to right: **George W. Gardiner, Capt. Levering Smith, Mr. and Mrs. Herb Karsch, and Nathan Wagner**



Manufacturer's Twenty Member Motion Picture Unit sets up to shoot Northrop F-89D all-weather jet interceptor for sequences in Northrop Training Department film.

INDUSTRY'S USE OF 16MM CAMERAS BROADENS

Northrop Aircraft Demonstrates Expanded Industrial Use of Mitchell Cameras

Over 100,000 feet of film were shot last year by two 16mm Mitchell cameras operated by a full-scale motion picture unit at Northrop Aircraft. Operating daily throughout the year, these 16mm cameras provide impressive evidence of the rising role of professional motion picture equipment in American Industry today.

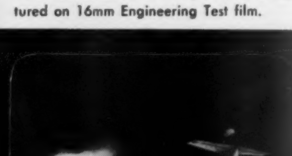
Northrop, a leader in airframe and missile manufacture, makes diversified use of their Mitchell cameras. Motion pictures range from employee activities to engineering test films—where re-shooting is impossible and where steady, accurately-framed film of superior quality is consistently delivered by Mitchell cameras.

No other single camera is today used by American Industry for such a broad range of filming requirements as is the Mitchell camera. Easy operating Mitchell cameras help create sales, meet delivery schedules, and systematize and accelerate research and development. For details about Mitchell equipment that will meet your specific needs, write today on your letterhead.

Alaska Bound test pilot Bob Love and Columnist Marvin Miles being filmed by Mitchell camera for Northrop Public Relations Department.

For Quality Control Film, Mitchell camera moves in for close shots of Scorpion F-89D.

104 Rocket Salvo of twin-jet F-89D is captured on 16mm Engineering Test film.



Mitchell Camera CORPORATION

666 WEST HARVARD STREET
GLENDALE 4, CALIFORNIA

Cable Address: "MITCAMCO"

***85% of professional motion pictures shown in theatres throughout the world are filmed with a Mitchell**

New Patents

George F. McLaughlin, *Contributor*

Blast fence for jet engines (2,726,830) Edward L. Brown, John M. Robertson and George E. Shafer, Middletown, Ohio assignors to Armco Steel Corp.

Spaced parallel curved vanes extending between a metal frame, and set at an angle to the horizontal. The vanes slope in the opposite direction to the framework to deflect the blast.

Pyrotechnic compositions. Raymond H. Heiskell, San Bruno, Calif.

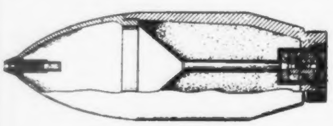
Dark burning no-flash ignition pellets for igniting a delayed ignition projectile tracer with up to 10% of lubricant.

Pellet (**Patent 2,726,943**) comprises at least 10% not to exceed 90% of an oxygen bearing compound selected from the group consisting of cupric oxide, barium peroxide, antimony pentoxide, lead dioxide and lead chromate.

Pellet (**Patent 2,726,944**) comprises 90–30% barium peroxide 10–70% of a sulfide selected from the group consisting of chromium monosulfide, chromium tetrosulfide, and selenium sulfide.

Fuel for and method of operating a jet engine (2,729,936). Sylvester C. Britton, Bartlesville, Okla., assignor to Phillips Petroleum Co.

A fixed size fuel consisting of between 5% and 95% by volume 1-olefins boiling between 90 and 500 F is injected into the combustion chamber. Air is injected into the chamber at a Mach number between 0.01 and 1.00 at a pressure between 0.2 and 40 atm, at a temp between −30 and 1040 F. Fuel is burned at a combustion efficiency within range from 40% to 100% to heat the air and gases.



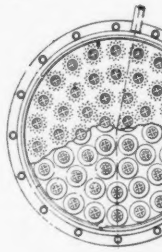
2,730,046

Safety device for the explosive head of a missile (2,730,046). Lars O. Bergstrom and Karl E. W. Hjelm, Bofors, Sweden, assignors to Aktiebolaget Bofors Corp.

Fuze magazine for detonating the charge of a rocket-type missile. The force of the initial linear acceleration by the missile in flight acts upon a yieldable means within the explosive head responsive to a physical magnitude developed and rendered effective upon discharge of the missile.

Method of and apparatus for guiding flight bodies along preselected flight paths (2,730,715). Gustave Guanella, Paul Guttinger, Max Lattman, and Georg Weber, Zurich, Switzerland, assignors to "Patelhold" Patentverwertungs and Electro-Holding A. G. and "Contraves" A. G.

Flight bodies are steered along a desired flight path in accordance with the degree of modulation of signal energy received on the flight body. Two individually distinctive beams of ultrashort-wave radio energy and of different angular spread, are employed. The beam of greater spread is rotated about the desired flight path with its axis of maximum intensity at a preselected relatively large angle, and the beam of lesser spread about the desired flight path is rotated with its axis of maximum intensity at a different and relatively small angle.



2,733,570

Injection head for jet propulsion system (2,733,570). George L. Macpherson, Scotia, N. Y., assignor to General Electric Co.

Sheet metal outlets in an injection head, having hollow conelike protusions, each terminating in a face. A flat sheet-metal faceplate has holes mating with the faces surrounding the faces for the issue of fue reactants.

Jet-driven helicopter rotor power plant control system (2,734,585). Richard H. Ball, Thomas B. Murdock, and Hugh M. Ogle, Schenectady, N. Y., assignors to General Electric Co.

Control system for a rotor-tip jet propelled helicopter. Control lever with a fulcrum variably positioned to control fuel-air ratio supplied to rotor tip jets in response to movement of main regulator.

Airplane control surface and jet deflecto arrangement (2,734,698). Joseph W. Straayer, Birmingham, Mich., assignor to Boeing Airplane Co.

Jet engine located beneath a control surface at the trailing edge of an airfoil. The surface is capable of movement from a normal neutral position into a controlling position. The rear end of the tailpipe located ahead of and sufficiently close to the surface so that the undeflected jet from the tailpipe impinges on the control surface or jet will clear surface with movement into its downward deflected position.

Support means (2,735,262). Frederick L. Geary, Springfield, Mass., assignor to United Aircraft Corp.

Afterburner with variable area nozzle surrounding the thrust nozzle and movable into a position for decreasing the effective area. When the thrust nozzle is in operation it expands into engagement with the ring surrounding the thrust nozzle, the space between the nozzles sealed to minimize flow of hot gas past the ring.

Combination rocket and ramjet power plant (2,735,263). Jack O. Charshafian, Englewood, N. J., assignor to Curtiss-Wright Corp.

Rocket carried in an open ductlike member in a jet engine. The rocket has a combination chamber and a conical conduit which discharges rocket combustion gases into a hollow conical jet to induce airflow through the duct.

Nozzle construction for jet engines (2,735,264). Charles S. Jewett, Ramsey, N. J., assignor to Curtiss-Wright Corp.

Adjustable nozzle comprising two pairs of concentric movable spherical segments. Each inner pair of segments has a smaller

Editor's Note: The patents listed above were selected from recent issues of the Official Gazette of the U. S. Patent Office. Printed copies of patents may be obtained at a cost of 25 cents each, from the Commissioner of Patents, Washington 25, D. C.

radius than the outer pair so as to be pivotally movable for varying the exhaust duct area.

Warship weapons system, including aircraft storing and launching arrangement (2,735,391). Herbert H. Buschers, Towson, Md., assignor to The Glenn L. Martin Co.

Cylindrical hangar for storing rockets or aircraft on the deck of a submarine. Rockets, stacked one above the other on guide rails, may be moved to a launcher which is locked in the raised position for launching, and retracted against the deck when not in use.

Jet propelled aircraft (2,735,633). James W. Manning, Huntington Park, Calif.

Fuselage having a pointed nose with bottom and top surfaces rounded and side portions flat. A pair of spaced passageways for air intake extend through the body and communicate with spaced cutouts in the tailpipe. Sprayed fuel is burned with air from the passageways to produce additional thrust.

Afterburner and exhaust nozzle controls for gas turbine engine (2,736,166). Frank C. Mock, St. Joseph, Ind., assignor to Bendix Aviation Corp.

Tailpipe terminating in a reaction jet. The jet area may be varied to maintain constant preselected pressure ratio between compressor inlet pressure and tailpipe pressure during all conditions of engine operation.

Air fuel ratio control for ramjets (2,736,167). Walter D. Teague, Jr., and Pasquale A. DePadova, Newark, N. J., assignors to Bendix Aviation Corp.

Temperature sensing means at the inlet and outlet conduits of the combustion chamber control the quantity of fuel pumped into the chamber. A fluid pressure turbine drives the variable speed fuel pump.

Liquid fuel control system for a rocket engine (2,738,648). Hugh M. Ogle, Schenectady, N. Y., assignor to General Electric Co.

Rocket propelled fuel system with a bellows responsive to pressure output of a liquid oxygen pump. A control regulates the flow of oxygen to the combustion chamber, and manual means are provided for adjusting the effect of the bellows.

Gas turbine engine with thrust balancing coupling (2,738,920). Chas. J. McDowall, New Augusta, Ind., assignor to General Motors Corp.

Means for opposing end thrust to reduce thrust bearing load. An elastic member between the stator and rotor is coupled to be stressed by thermal expansion, exerting a thrust on the rotor in opposition to the rotor end thrust.

Boundary layer control apparatus for compressor (2,738,921). George F. Hausmann, Hartford, Conn., assignor to United Aircraft Corp.

Scoop adjacent to the inner radial end of stator blades for inducting boundary layer flow along the inner wall of an annular passage. The flow is discharged into the passage adjacent to the outer wall of the passage.

Temperature responsive control system for gas turbine power plant having exhaust reheating (2,739,441). John H. Baker and John W. Jacobson, Schenectady, N. Y., assignors to General Electric Co.

Tail pipe reheat fuel burning for thrust augmentation. Variation from a predetermined desired temperature is corrected automatically by trimming the reheat fuel regulator.

New Equipment and Processes

Equipment

Electrical, Electronic

Resistor Network. Type 1299 is plug-in, epoxy molded, 9-pin miniature socket. Daven Co., 530 W. Mt. Pleasant, Livingston, N. J.

Printed Circuit Connector. Series 4PCSC available for 22 contacts. Electronic Sales Div., DeJur Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.

Power Resistor. Type PW-5 miniature 5 w, high temp, rectangular design. Fuse Resistor. Type FS functions as resistor under normal load conditions and fuse under abnormal conditions. International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

Counterpoise Relay. Tandem type, 24-pole double throw, 2 amp, 28 v dc with total weight of $10^1/_2$ oz. Cook Electric Co., 2700 Southport Ave., Chicago, Ill.

Aluminum Dry Battery. Replacement for zinc cell has long shelf life. Potential of 1.6 v or 1.7 v. Aluminum Corp. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

Test

Fatigue Tester. Multirange model has capacity of 120,000 lb. Ivy Co., Norwalk, Conn.

Compression and Tension. Tester has capacity of 60,000 lb and features stress-strain recorder. Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.

Transistor Tester. Model T-62 is direct reading. 50 w capacity. 5 current ranges from 50 to 500 ma. Scientific Specialties Corp., Snow & Union St., Boston 35, Mass.

Electrostatic Charge Meter. Aimed like pistol, determines charge and polarity. Custom Scientific Instruments, Inc., Kearny, N. J.

High-Speed Camera. Triad Model 500 features 200 fps single speed. Full speed in $^1/_3$ sec., 200 ft capacity. 28 v dc or 115 v ac. Triad Corp., 4515 Sepulveda, Sherman Oaks, Calif.

Surface Thermometer. For spot checks to 1000 F. Pacific Transducer Corp., 11836 W. Pico, Los Angeles 64, Calif.

Running Torque and Dynamometer. Type 200 for testing motors of $^1/_{10}$ to $^1/_4$ hp. Torque capacities of 1 in.-lb to 5 in.-lb with accuracy of $^1/_2$%. John Chatillon & Sons, 85 Cliff St., New York 38, N. Y.

Instrument Console. For environmental test equipment. Tenney Engineering, 1090 Springfield Rd., Union, N. J.

Creep Tester. 20,000-lb capacity with furnace for tests to 1800 F. Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

Wavelength Tester. Mercury 198 source in portable unit. 12.2 cm wavelength in 2400–2500 megacycle band. Output of 125 w. Accuracies of 1 part in one million. Baird Associates, Inc., 33 University Rd., Cambridge 38, Mass.

Portable X-Ray. 200 kv inspects 3 ft per min exposure. Detects defects or corrosion. Holger, Andreasen, Inc., 703 Market St., San Francisco, Calif.

Ultraviolet Microscope. Model UV-91 for structure determination and indication of absorption spectrum. Resolutions of 0.1–0.2 micron in full color. Boston Electronics Div., Norden-Ketay Corp., Snow & Union St., Boston 35, Mass.

Nondestructive Leak Detector. For hermetically sealed parts and containers. Reed-Curtis Nuclear Industries, Inc., 655 W. Washington Blvd., Los Angeles 15, Calif.

Radiation Measurement. Model HC amplifier and detector for infrared, visible, and ultraviolet spectrum. Baird Associates, 33 University Rd., Cambridge 38, Mass.

Electron Diffractograph. For direct observation or photo recording. 20–50 kv beam. Specimen sizes of 1 in. and sample tests of up to 1000 C are possible. Norden-Ketay Corp., 555 Broadway, New York 12, N. Y.

Oscillograph Camera. For 3-in. CRT. Type 339 offers full binocular vision, is self-supporting and produces prints one minute after exposure. Shutter speed of time, bulb, $^1/_{100}$, $^1/_{50}$, and $^1/_{25}$ sec. Allen B. DuMont Laboratories, Inc., 750 Bloomfield Ave., Clifton, N. J.

Mechanical

Flow Transmitter. Mercuryless, pneumatic balance. Transmits readings up to 1000 ft away. Range of 0–20 or 0–200 in. of water at 0.1% full scale sensitivity. Pressure ratings of 750–1500 psi. **Mechanical Flowmeter.** For differential pressures of 53, 119.25 or 212 in. of water. Pneumatic Pressure Controller. Ranges of 0–200 psig, accuracy of ±1%. Tel-O-Set Recorder. Indicator and controller for temperature, pressure, flow, and liquid level. Minneapolis-Honeywell Regulator Co., Wayne & Windrim St., Philadelphia 42, Pa.

Selector Valves. Solenoid-operated 3-way for $^1/_4$–$^1/_2$ in. tube sizes, 3–6 gpm flow rates. **Solenoid-Operated 3-Way Valve.** Series 6000 has operating pressure of 3000 psi, 18–30 v dc, −65 to +160 F. Aircraft Products Co., 300 Church Rd., Bridgeport, Pa.

Two-Way Valve. Straight-through, leakproof, for acids, etc. Stockdale Engineering Co., Haddonfield, N. J.

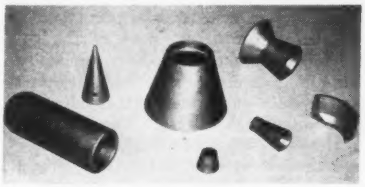
Straddle Carrier. 30,000-lb capacity, 131 hp gives speed of 38 mph. Clark Equipment Co., Ross Carrier Div., Benton Harbor, Mich.

Pressure Gage. 1-in. size for missile use. Ranges to 5000 psi, accuracy of ±2.5%, weight is 0.15 lb. United States Gage Co., 000 Clymer Ave., Sellersville, Pa.

Processes

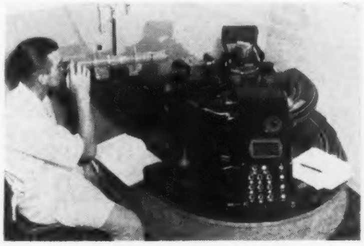
Working with Titanium. At a recent Solar Aircraft symposium on titanium it was emphasized that some alloys have been in mill production for less than one year. Some difficulties are: bend strength; formability of sheet material is not yet uniform. Suppliers are working on rolling techniques so that variance will be less than 5–8% of true flatness. Analytical standards for titanium and its alloys are yet to be established. Special shapes and types are not yet rapidly obtained. Suppliers are still on the "learning curve." Prices of finished materials range upward from $20 per lb. In engine design, however, it was pointed out that 1 lb saved in a jet engine allows a savings of 10–15 lb in structure.

Ceramics for Rockets. Silicon-nitride bonded silicon carbide as developed by the Refractories Division of Carborundum Co., Perth Amboy, N. J., is finding uses in rockets beyond nozzles (photo). Dimension tolerances of ±0.005 in. per in. of dimension can now be maintained. Special shapes (even including internal and external threads) are possible and oxidation resistance is very high. Possible applications include pump parts, acid spray nozzles, liners, etc.



Speedy Sealing. Small collapsible tubes are being used effectively to apply sealing compounds in aircraft and missile manufacture. This technique makes application less messy, saves material, and eliminates atmospheric contact.

Snark Accuracy. Tolerances on some machining operations on the Snark missile (Northrop Aircraft Co., Hawthorne, Calif.) have had to be held to as low as 30 sec of arc; in some cases, 1 sec of arc. Usual one degree of tolerance on conventional aircraft could not be used. Reason is to insure a minimum amount of error in guidance and critical components. For example, at a range of 5000 miles, tolerances as set above would allow the missile to come within 120 ft of its intended target. Optical precision is called for (photo). Granite foundations are needed for machining precision gears Tolerances are 0.1 sec of arc. Milling produces parallelism of 0.0002 in. in a 10-in. span.



Product Literature

Asbestos Safety Clothing. 11-page booklet describes line of asbestos suits, helmets, gloves, aprons, leggings, spats, shoes, blankets and curtains. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

New Shop Techniques. Techniques and devices developed at USAF Cambridge Research Center are described in "New Shop Techniques and Developments," PB 111668. Office of Technical Services, Dept. of Commerce, Washington, D. C. $0.75.

Noise. Human behavior under high intensity noise is described in "The Effects of Noise on Human Behavior," PB 111402. Office of Technical Services, Dept. of Commerce, Washington, D. C. $2.

Book Reviews

Ali Bulent Cambel, Northwestern University, *Associate Editor*

Conduction Heat Transfer, by P. J. Schneider, Addison-Wesley Publication Co., Inc., Cambridge, 1955, 395 pp. $12.50.

Reviewed by Robert Bromberg
The Ramo-Wooldridge Corporation and University of California

This book contains a surprisingly complete review of the techniques of solution of conduction heat-transfer problems. It is concerned with solutions of the heat conduction equation when applied to various geometries and including both steady-state and transient problems and distributed heat sources. The chief value of the book lies not in the fact that these equations are solved, but that the difficult details of solution—when geometry is complex and boundary conditions not simple—are presented in an understandable manner.

Most of the important mathematical procedures are restated so that the reader finds a minimum of background necessary. The standard methods of solving linear partial differential equations are reviewed and then applied to the problems of interest. Following this, the mathematics appropriate to the numerical solution of conduction problems is presented so that the basis for such solutions is available to the reader. The order of subject matter is as follows: Steady one-dimensional systems, extended surfaces and steady two-dimensional systems, with appropriate mathematics interspersed; steady state problems using numerical methods; steady heat source systems and porous systems; transient systems including numerical methods; experimental analogic methods. In all cases an ample number of examples are worked out in detail.

The author states: "The reader who is already conversant with heat-conduction literature will appreciate that this present text has little claim to originality." However, in this reviewer's opinion the author has done an excellent job of bringing together, in readable form, the material relating to conduction. About the only omission worth noting is a lack of emphasis on variable property problems. Situations in which both thermal conductivity and heat capacity vary appreciably with temperature (and including phase changes) are of considerable importance in many industrial applications; such problems could be profitably included in the sections on numerical methods (transient in particular) and on analogs.

It is noted in the Preface that the book is intended as a text for graduate-level courses and as a supplementary text for undergraduate courses. It will prove a useful addition to the library of the heat-transfer specialist concerned with conduction problems.

Preview of Second AGARD Combustion Book

by Ali Bulent Cambel

Although it is customary to review published books in these columns we shall deviate once in a while to give our readers prepublication reviews. We shall set this precedent by perusing the papers which were presented at the Second AGARD Combustion Colloquium held in Liege, Belgium, December 5-9, 1955.

The papers which will eventually be brought together as an AGARDograph and their respective authors are: "Scaling of Liquid Fuel Rocket Combustion Chambers," by Chandler C. Ross; "Fuels for Turbojet Powered Aircraft," by R. R. Hibbard and H. C. Barnett; "Fundamental Principles of Flammability and Ignition," by B. Lewis and G. von Elbe; "Problems of Combustion Under Altitude Condition (Treated From Fundamental Viewpoint)," by H. G. Wolfhard; "Quelques Considerations Sur La Convection De La Chaleur Aux Grandes Vitesses et Aux Temperatures Elevess," by E. A. Brun; "Thermal Ignition, With Particular Reference to High Temperatures," by R. S. Brokaw; "Recherche Du Bruleur Optimum en Ecoulement Air-Kerosene a Grande Vitesse," by B. Salmon and H. Vigne; "Inflammation et Allumage Dans Les Moteurs-Fusees a Propergols Liquides," by M. Barrère and A. Moutet; "Les Performances Des Moteurs D'Avions," by A. Capetti; "Combustion en Altitude Dans Les Turboreacteurs," by J. Soissons; "Scaling of Gas Turbine Combustion Systems," by D. G. Stewart; "Sources of Transport Coefficients and Correlations of Thermodynamic and Transport Data," by J. Hilsenrath; "Combustion in the Turbojet Engine," by S. Way; "The Influence of Altitude Operating Conditions on Combustion Chamber Design," by S. L. Bragg and J. B. Holliday; "Similarities in Combustion, a Review," by A. E. Weller; "The Ignition of Flowing Gases," by L. D. Wigg; "Fundamental Equations in Aerothermochemistry," by Theodore von Kármán.

It is significant that at least three papers were presented on the rather controversial and complex subject of scaling and similarity. In a review paper, Weller discusses the status of the field. Once again it is brought out that the problems of scaling which for individual components are occasionally tractable become ambiguous when complete systems with multifareous effects are considered. Stewart ably examines scaling in gas turbine combustion systems and shows by limited experimental data (for gutter and cone stabilizers, for example) that correlation between a full-size unit and a one-third size model operated at three times the pressure but the same velocity is quite good. The derivation of significant di-

mensionless parameters as well as the correlation of other experimental data in this chapter make it most significant and helpful to the development engineer. Ross in dealing with scaling in liquid fuel rocket motors suggests that the main reason for the very limited understanding of similarity is due to instability phenomena. In a comprehensive discussion Crocco analyzes existing scaling rules and makes some very significant remarks. These last two contributions are indeed most helpful to the person dealing with instability as well as with scaling in rocket motors. Lewis and von Elbe discuss the principles of flammability and ignition from a phenomenological viewpoint and expressly avoid the use of mathematics in an attempt to better understand the phenomena. They review some interesting observations and reiterate their belief in the excess enthalpy concept. They substantiate their thinking with experimental data but their suggestions require further interpretation in the light of strong conflicts with other observations. In a very elegant analysis, von Kármán develops the fundamental equations of aerothermochemistry. He discusses the meaning of the parameters related to chemical reactions and once again manifests his fine insight into scientific problems. This chapter serves as an excellent guide in relating empirical observations to analytical studies. Thus it is most significant because only when analysis and empirics are properly interrelated will aerothermochemistry be adequately understood.

In a contribution on high velocity combustion Salmon and Vigne use the sigma function as a criterion of stabilization. In two papers Brokaw and Wigg discuss ignition phenomena. Brokaw compares extensive data of ignition delay. Wigg considers the ignition of flowing gases. These two authors ably review the subject and their efforts together with that of others should do much in a more rational understanding of ignition phenomena, something badly needed.

Wolfhard reviews combustion phenomena at high altitudes and discusses the important influence of pressure on combustion. His paper includes empirical observations concerning both premixed and diffusion flames. Another basic problem pertinent to jet propulsion is aerodynamic heating and some of the existing equations are reviewed by Brun for so-called high speeds and elevated temperatures.

A more detailed knowledge of transport data and thermodynamic parameters is absolutely necessary in studying combustion. Hilsenrath reviews the work accomplished by himself, his associates, and others. In a series of chapters, Way, Barrère and Moutet, Soissons, Capetti, Hibbard and Barnett, Bragg, and Holliday discuss combustion phenomena under various circumstances in engines. The information and interpretations in these chapters should serve as an invaluable guide to the engine designer.

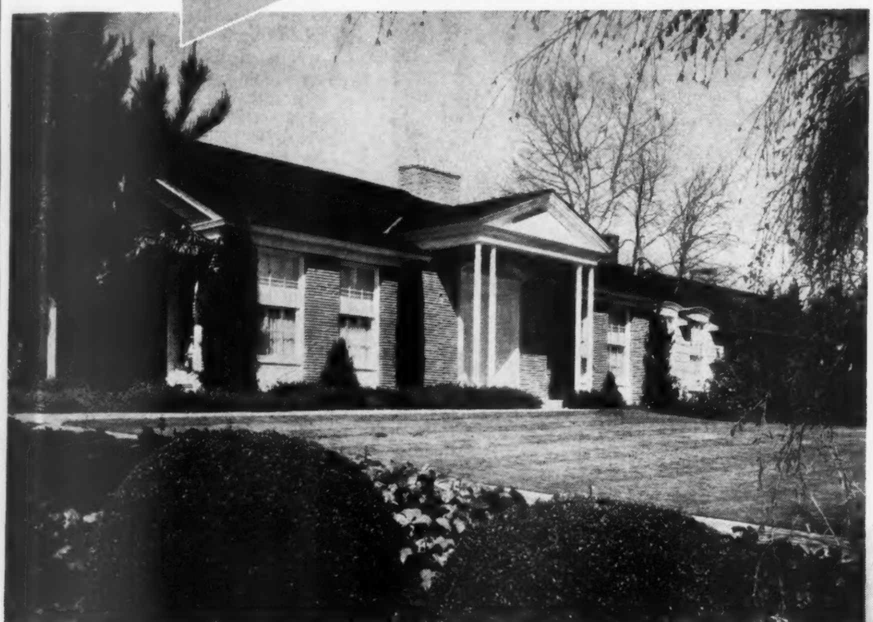
It is gratifying that the authors discuss their topics in the broad sense. This approach makes the contributions invaluable to both the experienced worker in the field and to the newly initiated one.

Engineers...

Look

ten years

ahead!



A Douglas engineer lives here

Will your income and location allow you to live in a home like this... spend your leisure time like this?

They can...if you start your Douglas career now!

Douglas has many things to offer the career-minded engineer!

...there's the stimulating daily contacts with men who have designed and built some of the world's finest aircraft and missiles!

...there's enough scope to the Douglas operation so a man can select the kind of work he likes best!

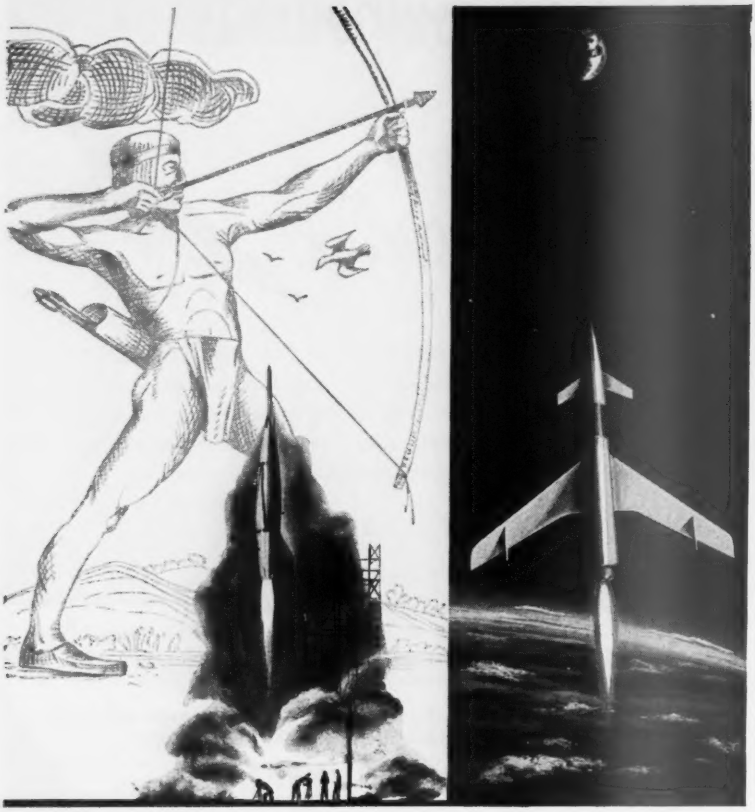
...there's security in the company's $2 Billion backlog of military and commercial contracts!

...and there's every prospect that in 10 years you'll be where you want to be professionally, and you'll be in both the income level and geographical location to enjoy life to its full.

For further information about opportunities with Douglas in Santa Monica, El Segundo and Long Beach, California and Tulsa, Oklahoma, write today to:

DOUGLAS AIRCRAFT COMPANY, INC.
C. C. LaVene, 3000 Ocean Park Blvd.
Santa Monica, California

DOUGLAS **First in Aviation**



Technical Literature Digest

M. H. Smith, *Associate Editor,* **and M. H. Fisher,** *Contributor*
The James Forrestal Research Center, Princeton University

Jet Propulsion Engines

The Turbojet with Afterburner for Supersonic Propulsion and Its Probable Limits Due to the Internal and External Thermal Barrier, by B. Santangelo, *L'Aerotecnica,* vol. 35, Dec. 1955, pp. 307–318 (in Italian).

A Runway Silencer for Jet Engines, by A. Boet, *Interavia,* vol. 11, April 1956, p. 291.

Experimental Investigation of Thrust Augmentation of 4000 Pound Thrust Centrifugal Flow Type Turbojet Engine by Blast-Off, by William L. Jones and Louis J. Bogdan, *NACA RM* No. E50D17, July 1950, 30 pp. (Declassified from Confidential, April 13, 1956.)

Experimental Investigation of Thrust Augmentation of 4000 Pound Thrust Axial Flow Type Turbojet Engine by Interstage Injection of Water Alcohol Mixtures in Compressor, by John H. Povolny, James Useller, and Louis Chelko, *NACA RM* No. E9K30, April 1950, 42 pp. (Declassified from Confidential, April 13, 1956.)

Drag Turbine Performance, by O. E. Balje, *ASME Paper* No. 56-AV-6, March 1956, 21 pp.

A Pod Mounted Gas Turbine Driven Auxiliary Power Unit, by R. Kress, *ASME Prepr.* No. 56-5-10, Jan. 1956, 8 pp.

Application Factors for Small Gas Turbines, by Henry C. Hill, *Machine Design,* vol. 28, Feb. 9, 1956, pp. 133–134.

Power Panorama, by Joe Stein, *Naval Aviation News,* Feb. 1956, pp. 1–9.

Pneumatic Computer Controls Engine Performance, *Design News,* vol. 11, Jan. 15, 1956, pp. 24–25.

Heat Transfer and Fluid Flow

Gas Flow Charts for Orifices and Nozzles, by Edward J. Gibbons, *Chem. Engng.,* vol. 63, June 1956, p. 264.

Noise Measurement Around Some Jet Aircraft, by A. C. Pietrasanta, *J. Acoust. Soc. Amer.,* vol. 28, May 1956, pp. 434–442.

An Easy Way to Determine Heat Transfer Coefficients, by R. E. Winston and Loyal Clarke, *Petroleum Refiner,* vol. 35, May 1956, pp. 227–229.

Dynamics of Vapor Bubbles and Boiling Heat Transfer, by H. K. Forster and N. Zuber, *A. I. Ch. E. Journal,* vol. 4, Dec. 1955, pp. 531–535.

Boundary Layer in a Converging Nozzle with a Spherical Nozzle, by Lakshmi SanYal, *Bull. Calcutta Math. Soc.,* vol. 47, June 1955, pp. 65–71.

Experimental and Analytical Investigation of Secondary Flows in Ducts, by Howard Z. Herzig and Arthur G. Hansen, *Inst. Aero. Sciences Prepr.* 593, Jan. 1956, 23 pp.

Effect of Transverse Body Force on Channel Flow With Small Heat Addition, by Simon Ostrach and Franklin K. Moore, *NACA TN* 3594, Feb. 1956, 31 pp.

Performance of a Pulsed Spray Column, by C. J. Billerbeck, Jack Farquhar III, R. C. Reid, J. C. Bresee, and A. S. Hoffman, *Indust. Engng. Chem.,* vol. 48, Feb. 1956, pp. 183–187.

The Performance Characteristics of a Small Rocket-Type Nozzle, by Franklin P. Durham, *Colorado Univ., Engng. Expt. Station, Summary Rep.* 6, June 1955, 31 pp.

Alternating Flow of Fluid in Tubes, by C. K. Stedman, *Statham Labs., Inc., Instrument Note* 30, Jan. 1956, 7 pp.

Investigation of Flow in the Throat Region for a Hypersonic Nozzle, by R.E. Oliver and H. T. Nagamatsu, *Calif. Inst. Tech. Guggenheim Aero. Lab. Hypersonic Wind Tunnel Mem.* No. 24, Jan. 1955, 18 pp.

Correlation of Maximum Heat Flux Data for Boiling of Saturated Liquids, by Warren M. Rohsenow and Peter Griffith, *Mass. Inst. Tech. Div. Indust. Coop. TR* No. 6, March 1956, 6 pp.

Unsteady Boundary Layer and Heat Transfer Phenomena—A Literature Survey, by Robert S. Wick, *Calif. Inst. Tech. Jet Propulsion Lab. Prog. Rep.* No. 20-279, Aug. 1955, 24 pp.

Self Shielding in Rectangular and Cylindrical Geometries, by Harold Schneider, Paul G. Saper, and Charles F. Kadow, *NACA TN* No. 3661, April 1956, 40 pp.

An Investigation of the Flutter Characteristics of Compressor and Turbine Blade System, by Chi-Teh Wang, Frank Lane, and Robert J. Vaccaro, *J. Aero. Sci.,* vol. 23, April 1956, pp. 335–344.

Some Effects of Guide-Vane Turning and Stators on the Rotating Stall Characteristics of a High Hub-Tip Ratio Single-Stage Compressor, by Eleanor L. Castilow and Merle C. Hubbert, *NACA TN* No. 3711, April 1956, 52 pp.

Preliminary Investigations of Helmholtz Resonators for Damping Pressure Fluctuations in 3.6 Inch Ram Jet at Mach Number 1.90, by Jerome L. Fox, *NACA RM* No. E51C05, May 1951, 24 pp. (Declassified from Confidential, March 16, 1956.)

Fuel Injection Studies with Impinging Jet Nozzles, *Penn. State Univ., Dept. Engng. Res., Final Rep.,* Oct. 1955, 33 pp.

Method of Calculating Core Dimensions of Crossflow Heat Exchanger with Prescribed Gas Flows and Inlet and Exit States, by E. R. G. Eckert and Anthony J. Diaguila, *NACA TN* No. 3655, April 1956, 25 pp.

Stereoscopic Photography of Suspended Particles in Aerodynamic Flow, by A. Girard and E. Robert, *Recherche Aeron.,* No. 49, Jan.-Feb. 1956, pp. 31–39 (in French).

Calculations for Mass Transfer at a Plane Surface Along Which Flow Occurs, at High Partial Pressure Gradients, by E. Eckert and V. Lieblein, *Gt. Brit. Roy. Aircr. Estab. Lib. Translation* No. 540, Sept. 1955, 19 pp. (Translated from *Forsch. Gebiete Ingenieurwesens,* vol. 16, 1949, pp. 33–42.)

Fuels, Propellants, and Materials

Compilation of Data on Army, Navy, and Commercial Electric Squibs, by Robert E. Betts, *Redstone Arsenal, Ord. Missile Labs., Rep.* No. 3J14N1, Jan. 1956, 137 pp.

A Microscopic Examination of Extruded Double Base Propellants, by J. Quinlan, *Franford Arsenal, Rep.* No. R-1302, Dec. 1955, 18 pp.

Investigation of Effects of Additives on Storage Properties of Fuming Nitric Acids, by Charles B. Feiler and Gerald Morrell, *NACA RM* No. E52J16, 1952. (Declassified from Confidential, March 16, 1956.)

Field Methods for the Determination of Hydrazine and Water in Furfuryl Alcohol-Aniline Rocket Fuel Mixtures, by Ralph F. Muraca, Stephen P. Vango, and Lois L. Taylor, *Calif. Inst. Tech. Jet Propulsion Lab. Progr. Rep.* No. 20-284, Feb. 1956, 7 pp.

Studies on the Synthesis of Hydrazine, by L. F. Audrieth and others, *Univ. of Illinois, Final Summary Rep.,* Jan. 15, 1955, 31 pp.

Some Physical Measurements on JP-5 Fuels, by J. J. Hydock, D. E. Drysol, and R. V. Shelton, *North American Aviation, Inc., Rep.* AL-2185, Aug. 26, 1955, 19 pp.

On the Development of Titanium and First Applications in Aircraft Construction (in Italian), by R. M. Corelli, *Aerotecnica,* vol. 35, Oct. 1955, pp. 235–248.

Liquid-Vapor Equilibria in the System Ammonia-Hydrazine at Elevated Temperatures, by Russell S. Drago and Harry H. Sisler, *J. Phys. Chem.,* vol. 60, Feb. 1956, pp. 245–249.

Pumpability of Aircraft Turbine Lubricants at Low Temperatures, by E. S. Starkman and J. H. Bridges, *Lubrication Engng.,* vol. 12, Jan.-Feb. 1956, pp. 43–47.

Method for Determining the Tensile Properties of Solid Rocket Propellants. I. Nitrocellulose Base Propellants, by Joint Army-Navy-Air Force Panel on Physical Properties of Solid Propellants, *Solid Propellant Information Agency,* SPIA/PP8, March 1956, 56 pp.

Elevated Temperature Fatigue Properties of Two Titanium Alloys, by William K. Rey, *NACA RM* No. 56B07, April 1956, 28 pp.

Investigations into Blade Root Fixings of High-Temperature Steels, by W. Siegfried, *Trans. ASME,* vol. 78, Feb. 1956, pp. 327–338.

Combustion

The Ignition of Combustible Gases by Converging Shock Waves, by James A. Fay and Edward R. Lekawa, *Cornell Univ., Grad. School of Aeron. Engng.* (*Off. Sci. Res. TN*-55-238), June 30, 1955, 12 pp.

Theory of Detonations: the Fundamental Equations of Hydrodynamics and Shock Waves, by Bruno J. Zwolinski, *Stanford Res. Inst., Poulter Labs., Tech. Rep.* 2, Feb. 15, 1954, 18 pp.

Flame Propagation: the Random Walk of Chemical Energy, by Henry Eyring, J. Calvin Giddings, and Lowell G. Tensmeyer, *Utah Univ. TN* 15 (*Off. Sci. Res. TN*-55-363), July 1955, 10 pp.

Phase Contrast Observations of Flames, by M. J. Saunders and A. G. Smith, *J. Appl. Phys.,* vol. 27, Feb. 1956, pp. 115–117.

Techniques for the Determination of

Composite Profiles of Flame Fronts, by R. M. Fristrom, R. Prescott, and C. Grunfelder, *Johns Hopkins Univ., Appl. Phys. Lab.*, CM-858, Dec. 1955, 30 pp.

On Flame Propagation in Explosive Mixtures of Gases. I. General Theory. II. On the Decomposition Flame of Ozone. III. Flame Propagation in Mixtures of Methane and Nitrogen Air, Helium Air, and Argon Air, by Robert Sandri, *Can. J. Chem.*, vol. 34, Mar. 1956, pp. 313–337.

The Effect of Atmospheric Depletion in Spherical Diffusion Flames, by R. J. Cvetanovic, *Can. J. Chem.*, vol. 34, Jan. 1956, pp. 54–64.

Terrestrial Flight, Vehicle Design

A Method for Calculating the Mass Ratios of Step Rockets, by M. Vertregt, *J. Brit. Interplan. Soc.*, vol. 15, March-April 1956, pp. 95–97.

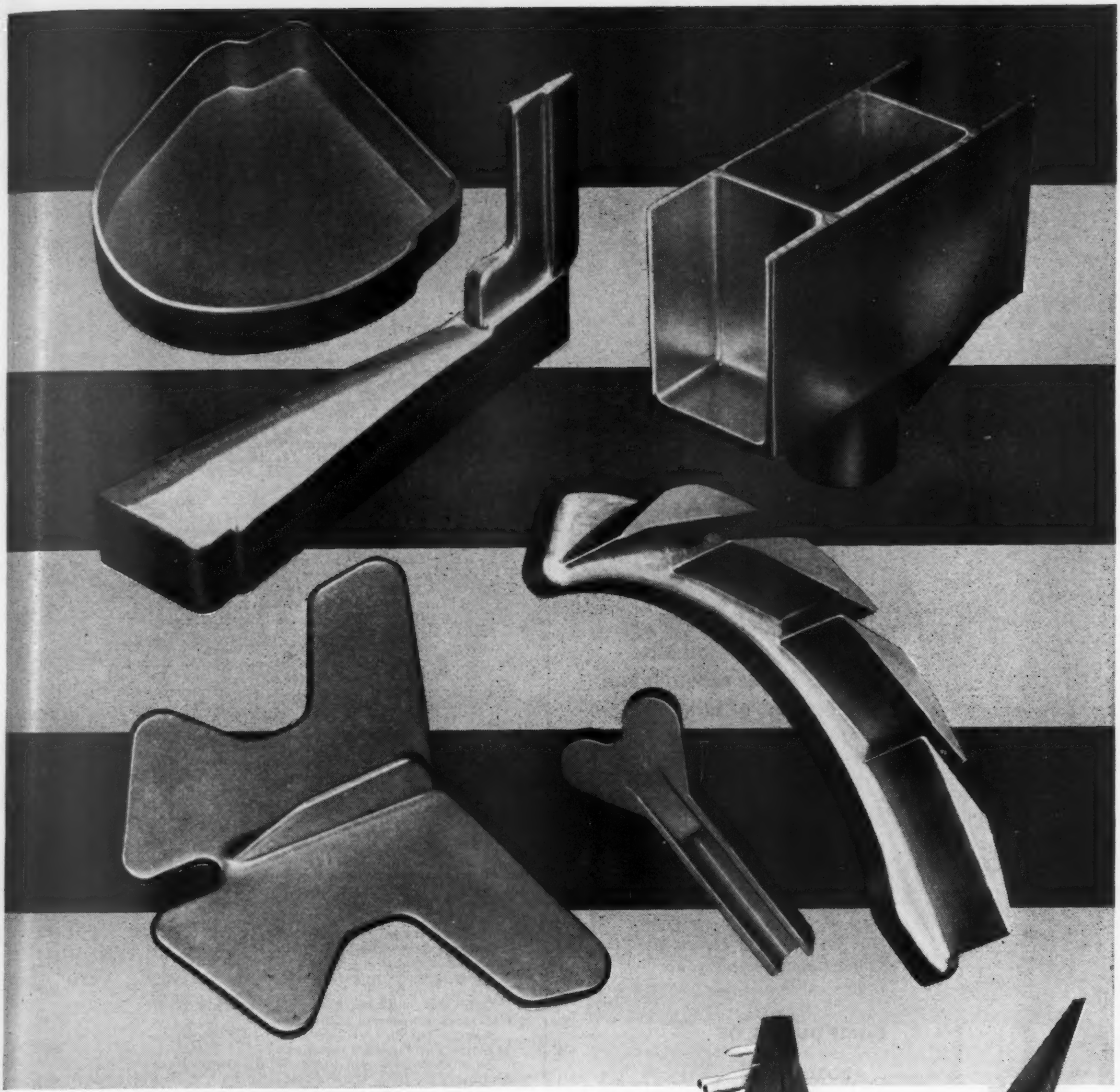
Growing a Reliable Missile, by Richard R. Carhart, *Aeron. Engng. Rev.*, vol. 15, Feb. 1956, pp. 28–33.

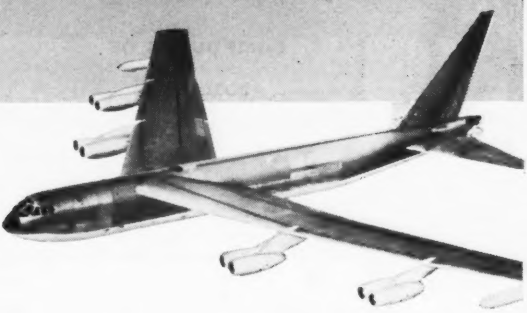
Designing Safety into High Speed Jets, by Irwin Stambler, *Aviation Age*, vol. 25, March 1956, pp. 26, 28–31.

Corrugated Nozzles Cut Jet Noise, by F. B. Greatrex, *Aviation Age*, vol. 25, March 1956, pp. 59–61, 63.

Highly Maneuverable Tactical Missiles Use Annular Wings, by A. R. Weyl, *Aviation Age*, vol. 25, March 1956, pp. 50–52, 54–57.

The Relative Geometry and Motion of a Missile's Flight Path and the Range Geodesic on a Spheroidal Earth, by L. M. Rauch, *Consolidated Vultee Aircr. Corp. Rep.* No. FZA-089, April 18, 1955, 65 pp.





No-draft forgings by Kaiser Aluminum

Kaiser Aluminum's Erie plant has been successful in meeting its customers' ever-growing needs for no-draft forgings.

Shown on this page are a few of the many no-draft forgings produced by Kaiser Aluminum on *existing equipment* for the aircraft industry.

Additional equipment—especially designed for no-draft forgings—will soon be installed to greatly increase our capacity for these specialized forgings.

Kaiser Aluminum no-draft forgings give you the benefits of substantial cost savings through the elimination of machining, plus extremely light weight with high strength, close tolerances, and superior finish.

When you submit your aluminum forging inquiry to Kaiser Aluminum, our highly skilled engineering staff will evaluate the forging to determine its suitability as a no-draft forging.

For immediate service, call any Kaiser Aluminum sales office listed in your local telephone directory. Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Building, Chicago 11, Illinois; *Executive Office*, Kaiser Building, Oakland 12, California.

Kaiser Aluminum

Index to Advertisers


B-61 Martin Matador


TELEMETRY
RECEIVING STATION

Jet Propulsion

ARS

AMERICAN ROCKET SOCIETY

ROSTER
1956

JULY 1956
(in 2 parts)
Vol. 26 No. 7, Part

1956
ROSTER
AMERICAN ROCKET SOCIETY

500 Fifth Avenue New York 36, N. Y.

OFFICERS

President
NOAH S. DAVIS

Vice-President
ROBERT C. TRUAX

Executive Secretary
JAMES J. HARFORD

Secretary
A. C. SLADE

Treasurer
ROBERT M. LAWRENCE

General Counsel
ANDREW G. HALEY

Editor-in-Chief
MARTIN SUMMERFIELD

BOARD OF DIRECTORS

Three-year term expiring on dates indicated

ANDREW G. HALEY, 1957, Chairman

J. B. COWEN, 1956

S. K. HOFFMAN, 1958

H. W. RITCHEY, 1956

MILTON ROSEN, 1957

H. S. SEIFERT, 1958

KURT STEHLING, 1958

GEORGE P. SUTTON, 1956

WERNHER von BRAUN, 1957

ACTIVITIES

AIMS AND FUNCTIONS: The American Rocket Society is a national association of engineers and scientists devoted to "the development and application of the principles of jet propulsion in devices such as liquid and solid propellant rocket and air-breathing engines, and in applications such as aircraft, guided missiles, and space vehicles" and to "the development of the sciences and engineering techniques pertaining thereto" such as instrumentation, guidance and control, high temperature materials, upper atmospheric research, aerodynamics, structures, combustion, fuels and propellants, heat transfer, etc. ARS has always maintained a deep interest in responsible scientific study of space flight and in fostering sound professional and public interest in this subject. The Society carries out its aims through:

1. Section Meetings, held periodically at most of the centers of rocket and jet propulsion activity throughout the country. Sections are self-governing and programs are both technical and social.

2. Regional Meetings, which include technical sessions as well as field trips to rocket, guided missile and aircraft establishments, observatories, etc. These meetings are often held in cooperation with other technical societies.

3. The Annual ARS Convention. Held in conjunction with the ASME Convention, this gathering includes technical sessions during which original papers are presented on all aspects of the Society's interests. Outstanding guest speakers are presented at luncheon and dinner meetings and the ARS Awards are presented. Awards include the Robert H. Goddard Memorial Award for work in liquid propellants, the C. N. Hickman Award for solid propellants, the James H. Wyld Memorial Award for outstanding application of rocket power, the ARS Astronautics Award for contribution to the advance toward space flight, the G. Edward Pendray Award for rocket and jet propulsion literary effort, and the ARS Student Award for the best student paper on rocket and jet propulsion. Fellowships are also presented at this meeting to leading figures in the field.

The ARS Library, located in New York, contains historical as well as current material relating to rocket progress.

An affiliation exists between the American Rocket Society and the American Society of Mechanical Engineers which permits ARS members to use the Engineering Library in New York, attend ASME Sectional and National meetings and allows the purchase of preprints at member rates.

MEMBERSHIPS: Four types of membership are open in the society:

MEMBER: Members shall consist of engineers and scientists who are actively engaged in the development or application of rocket or jet propulsion, other persons who have been working on the development or application of rocket or jet propulsion for at least four years and who hold or have held responsible positions in these fields, and such persons as may be deemed eligible for this class of membership by the Board of Directors by virtue of their outstanding accomplishments in other fields and their unusual interest in the purpose of the Society.

ASSOCIATE MEMBER: Associate members shall consist of persons, other than students, who are actively interested in the development or application of rocket or jet propulsion.

STUDENT MEMBER: Student members shall consist of persons not less than 17 years of age whose principal occupation is study at a recognized educational institution or who are serving as enlisted personnel in the Armed Forces of the United States, and who are interested in the development or application of rocket or jet propulsion.

CORPORATE MEMBER: Corporate Members shall consist of educational, scientific or industrial organizations who may choose this method of expressing their interest in the development or application of rocket or jet propulsion, and who are considered acceptable by the Board of Directors. Each Corporate Member shall be entitled to five representatives with the rights and privileges of Members.

PUBLICATIONS: JET PROPULSION, Journal of the American Rocket Society, is published monthly and mailed to all members. Edited by distinguished scientists, the Journal is recognized as the most complete and authoritative source of original technical material on rocketry, jet propulsion, astronautics, and allied sciences.

It also includes feature articles on industry, government and university activities, news items, and ARS happenings. It carries a calendar of coming meetings, a digest of books and articles published on rocket and jet propulsion in this country and abroad, and reviews by authorities on current books.

Information on advertising rates for the Journal can be obtained from the Secretary.

BOOKS AND TECHNICAL PAPERS: The Society makes available to its members at special rates, technical papers, reprints and other useful information bearing on jet propulsion, rockets and their application. It also has available back issues of the Journal and its predecessor, Astronautics.

HONORARY MEMBERS

ESTHER C. GODDARD

HARRY F. GUGGENHEIM

FELLOW MEMBERS

1949—Theodore von Karman

1950—Calvin M. Bolster
Louis Dunn
G. Edward Pendray
Fritz Zwicky
M. J. Zucrow

1951—Charles E. Bartley
Benjamin H. Coffman, Jr.
Edwin H. Hull
Chandler C. Ross
H. N. Toftoy

1952—William L. Gore
John Sloop
Wernher von Braun
Weldon Worth
Roy Marquardt

1953—Luigi Crocco
C. C. Furnas
R. E. Gibson
James Mullen
William M. Smith

1954—Lawrence D. Bell
K. J. Bossert
E. N. Hall
S. K. Hoffman
A. C. Slade
Clyde Tombaugh
Elmer Wheaton
L. D. White

1955—Ali Bulent Cambel
B. L. Dorman
Roy Healy
Robert H. Jewett
J. H. Sides
E. G. Uhl
Paul F. Winternitz

AWARDS AND RECIPIENTS

Robert H. Goddard Memorial Award

1948—John Shesta
1949—Calvin M. Bolster
1950—Lovell Lawrence, Jr.
1951—Robert C. Truax
1952—Richard W. Porter
1953—David A. Young
1954—A. M. O. Smith
1955—E. N. Hall

C. N. Hickman Award

1948—Frank Malina
1949—James A. Van Allen
1950—Leslie Skinner
1951—William Avery
1952—A. L. Antonio
1953—Charles E. Bartley
1954—Harold W. Ritchey
1955—F. S. Miller

G. Edward Pendray Award

1951—George P. Sutton
1952—M. J. Zucrow
1953—H. S. Tsien
1954—Martin Summerfield
1955—Walter Dornberger

ARS Student Award

1948—N. Y. Rothmayer, A. Bernstein, F. D. Linzer, A. Sherman, City College of New York
1949—Leon Cooper, City College of New York
1950—E. Knuth and C. Beighley, Purdue University
1951—L. Rosenthal and David Elliott, California Institute of Technology
1952—Richard W. Foster, Purdue University
1953—Alfred Goldenberg, University of California
1954—No award presented
1955—Richard W. Foster, Purdue University

ARS Astronautics Award

1954—Theodore von Karman
1955—Wernher von Braun

James H. Wyld Memorial Award

1954—Milton Rosen
1955—John P. Stapp

SECTIONS

ALABAMA
President: Conrad Swanson
V. President: Cliff E. Fitton, Jr.
Secretary: William A. Davis
Treasurer: Lawrence N. Nicastro

ANTELOPE VALLEY
President: Richard A. Schmidt
V. President: H. S. Stratton
Treasurer: J. A. Hoffman
Secretary: W. Johnson

ARIZONA
President: C. J. Green
V. President: Sidney Wade
Secretary: George Hacher
Treasurer: Frank H. Barris

CENTRAL TEXAS
Acting President: E. E. Rush
Secretary: R. C. Terry

CHICAGO
President: Gerald M. Platz
V. President: John Krc, Jr.
Secretary: Andrew A. Affrunti
Treasurer: Dusan J. Ljubenko

CLEVELAND-AKRON
President: Adelbert O. Tischler
V. President: Louis R. Lazo
Secy-Treas: Howard W. Douglas

COLUMBUS
President: M. W. Jack Bell
Secy-Treas: David B. Haswell

CONNECTICUT VALLEY
President: Charles H. King, Jr.
V. President: Robert L. Mitton
Secretary: Sheldon Dolinger
Treasurer: Chester B. Hayes

DETROIT
President: Fred Klemach
V. President: Charles W. Williams
Treasurer: Lovell Lawrence, Jr.
Secretary: R. B. Morrison

FLORIDA
President: Verl O. Smith
V. President: R. L. Yordy
Secretary: Paul B. Campbell
Treasurer: R. H. Reynolds

FORT WAYNE
President: Lloyd Wadekamper
V. President: Jerry Fogel
Secretary: Paul W. Kruse
Treasurer: Marion B. Stults

INDIANA
President: James A. Bottorff
V. President: R. K. Rose
Secretary: Wayne H. Munyon
Treasurer: Donald L. Crabtree

MARYLAND
President: William A. Webb
V. President: A. W. McCourt
Secretary: Henry A. Smith
Treasurer: Samuel Fradin

NATIONAL CAPITAL
President: J. D. Gilchrist
V. President: Erik Bergaust
Secretary: M. R. Comer, Jr.
Treasurer: Richard Snodgrass

NEW ENGLAND
President: Lawrence Levy
V. Pres: Charles N. Saffer, Jr.
Secretary: Kathleen Manion
Treasurer: A. John Gale

NEW MEXICO-WEST TEXAS
President: Russell K. Sherburne
V. President: G. Harry Stine
Secretary: Keith E. Hennigh
Treas: Lawrence W. Gardenhire

NEW YORK
President: Charles J. Marsel
V. President: Paul M. Terlizzi
Treasurer: Charles G. Sage
Secretary: Rudolf L. Graupe

NIAGARA FRONTIER
President: William M. Smith
V. President: Stanley F. Lewinski
Treasurer: John H. Keefe
Corres. Secy: Daniel Y. Sing
Rec. Secy: Walter J. Zebrowski

NORTH TEXAS
President: George H. Craig
V. President: Harry W. Graham
Secretary: Jack Wurts
Treasurer: Charles F. Crabtree

NORTHEASTERN NEW YORK
President: A. H. Fox
V. President: Theodore C. Swartz
Secretary: George E. Emmons
Treasurer: A. M. Brown

NORTHERN CALIFORNIA
President: A. J. Eggers, Jr.
V. President: A. K. Oppenheim
Secretary: M. Evans
Treasurer: V. I. Stevens

PACIFIC NORTHWEST
President: Jim C. Drury
V. President: James H. Fisher
Secretary: Joseph A. Brousseau
Treasurer: George W. Hettrick

PRINCETON GROUP
President: Jerry Grey
V. President: George B. Matthews
Secretary-Treasurer: Marshall H. Fisher

SACRAMENTO
President: Frank Coss
V. President: Daniel M. Tenenbaum
Treasurer: Raymond C. Stiff
Secretary: Wayne H. Fenton

SAINT LOUIS
President: James J. Mazzoni
V. President: Robert A. Cooley
Secretary-Treasurer: P. W. Godfrey

SAN DIEGO
President: Krafft Ehricke
V. President: Jack Clothier
Treasurer: Eugene C. Sims
Secretary: Louis F. Muller

SOUTHERN CALIFORNIA
President: Richard D. Geckler
V. President: James A. Broadston
Secretary: William J. Flaherty
Treasurer: Robert G. MacEwan

SOUTHERN OHIO
President: W. C. Cooley
V. President: T. P. Meloy
Secretary: Milt Dowell
Treasurer: Connie Pope

TWIN CITIES
Acting President: C. C. Chang
Acting Treasurer: Melvin Diels
Acting Secretary: Thomas F. Irvine, Jr.

STUDENT CHAPTERS

ACADEMY OF AERONAUTICS
President: Alex Havriliak
V. President: Anthony Varvaro
Secretary: Norman Lange
Faculty Sponsor: Ralph Hautau

UNIVERSITY OF MICHIGAN
President: Richard Signor
V. President: J. B. Bullock
Treasurer: H. Muhrlein, Jr.
Record Secretary: Bradford Barr
Corres. Secy: Herbert Arkin, Jr.
Faculty Sponsor: R. B. Morrison

NEW YORK UNIVERSITY
President: Ned Greenberg
V. President: Bertram Kramer
Secretary: Larry Gottlieb
Treasurer: Andrew Dapuzzo
Faculty Sponsor: Michael Maccrone

PARKS COLLEGE (Saint Louis University)
President: James M. Llewellyn, Jr.
V. President: Dale Anderson
Treasurer: Joe Kelley
Tech. Activities Chair: Pete Butkewicz
Faculty Sponsor: Franz Hug

POLYTECHNIC INSTITUTE OF BROOKLYN
President: Mario Cardullo
Secretary: Bernard Shatz
Treasurer: Joseph Codispoti
Faculty Sponsor: T. P. Torda

COMMITTEES

EXECUTIVE

Andrew G. Haley, Chairman
Noah S. Davis
James J. Harford
Robert M. Lawrence
Milton Rosen
A. C. Slade
Kurt Stehling
Martin Summerfield (ex-officio)

AWARDS

J. B. Cowen, Chairman
S. K. Hoffman
H. W. Ritchey
Kurt Stehling

SPACE FLIGHT

S. K. Hoffman, Chairman
J. B. Cowen
Milton Rosen
Wernher von Braun

POLICY

R. C. Truax, Chairman
Noah S. Davis
Andrew G. Haley
James J. Harford
H. S. Seifert
Martin Summerfield

FINANCE

H. W. Ritchey, Chairman
Robert M. Lawrence
Milton Rosen
Martin Summerfield

PROGRAM

Andrew G. Haley, Chairman
H. S. Seifert
Kurt Stehling
Martin Summerfield

MEMBERSHIP

George P. Sutton, Chairman
James J. Harford
A. C. Slade

MONOPROPELLANT TEST METHODS

H. F. Calcote
W. A. Cuddy
I. Glassman, Secretary
J. H. Keefe
W. B. Moen
L. L. Rapp
P. M. Terlizzi
J. P. Thackrey
P. F. Winternitz

PAST PRESIDENTS

1930-32—DAVID LASSER
1932 —G. EDWARD PENDRAY
1932-33—NATHAN SCHACHNER
1933-34—LAURENCE MANNING
1934-36—G. EDWARD PENDRAY
1936-37—JOHN SHESTA
1937-40—ALFRED P. AFRICANO
1940-42—H. FRANKLIN PIERCE
1942-43—ROY HEALY
1943-44—CEDRIC GILES
1944-46—JAMES H. WYLD
1946 —LOVELL LAWRENCE, JR
1947 —ROY HEALY
1948 —CHARLES A. VILLIERS
1949-50—WILLIAM L. GORE
1951 —H. R. J. GROSCH
1952 —C. W. CHILLSON
1953 —F. C. DURANT, III
1954 —ANDREW G. HALEY
1955 —R. W. PORTER

CORPORATE MEMBERS

ACF Industries, Inc.
Accessory Products Corporation
Aerojet-General Corporation
Aerophysics Development Corporation
Air Products, Incorporated
Alco Products, Inc.
American Machine and Foundry
American Bosch Arma Corporation
  Arma Division
Atlantic Research Corporation
Avco Manufacturing Corporation
  Research and Advanced Development Div.

Beech Aircraft Corporation
Bell Aircraft Corporation
Bell Telephone Laboratories, Incorporated
Bendix Aviation Corporation
  Products Division, Missile Section
Boeing Airplane Company
Brush Electronics Company

Carbide and Carbon Chemicals Company
Carborundum Company
Chance Vought Aircraft, Incorporated
Chrysler Corporation—Missile Operations
Continental Aviation and Engineering Corp.
Curtiss-Wright Corporation

Douglas Aircraft Company, Incorporated
Allen B. DuMont Laboratories, Incorporated

Electro-Mechanical Products Company
Esso Research and Engineering Company
Experiment, Incorporated

Fairchild Engine and Airplane Corporation
Federal Telecommunication Laboratories
Firestone Tire and Rubber Company
Fischer and Porter Company
Food Machinery and Chemical Corporation
Ford Motor Company
  Scientific Laboratory

The Garrett Corporation
General Dynamics Corporation
General Electric Company
  Aircraft Gas Turbine Development Dept.
General Motors Corporation
  Allison Division
Genisco, Incorporated

Grand Central Rocket Company
Greenleaf Manufacturing Company

Harvey Machine Company, Incorporated
Haynes Stellite Company
Hercules Powder Company
Hoffman Laboratories
Horning-Cooper, Inc.
Hughes Aircraft Company

M. W. Kellogg Company
Kelsey-Hayes Wheel Company

Leach Corporation
Linde Air Products Company
Lockheed Aircraft Corporation

Marquardt Aircraft Corporation
W. L. Maxson Corporation
McDonnell Aircraft Corporation

Norden-Ketay Corporation
North American Aviation, Incorporated

Olin Mathieson Chemical Corporation
Orenda Engines, Limited

Pan American World Airways, Incorporated
Philco Corporation
Phillips Petroleum Company
  Rocket Fuels Division

Ramo-Wooldridge Corporation
Reaction Motors, Incorporated
Republic Aviation Corporation
Laurance S. Rockefeller
Ryan Aeronautical Company

Societe Nationale de Constructions
  Aeronautiques du Sud-Quest

Texas Metal and Manufacturing Co., Inc.
Thieblot Aircraft Company, Incorporated
Thiokol Chemical Corporation
Thompson Products, Incorporated

United Aircraft Corporation
United States Steel Corporation
  Consolidated Western Steel Division

H. A. Wagner Company
Western Gear Works
Westinghouse Electric Corporation

LEGEND

(f) Fellow Member

(m) Member

(a) Associate Member

(s) Student Member

AMERICAN ROCKET SOCIETY

Membership List

A

AARON, ROBERT H., (m) Vice Pres., Engr., G. O. Noville & Associates, Inc., 1666— 9th St., Santa Monica, Calif. Home: 3324 Colby Ave., Los Angeles 66, Cal.

ABBOTT C. WEBSTER, (a) Citizens Fidelity Bank & Trust Co., Louisville 1, Kentucky. Home: 3750 Upper River Rd., Louisville 7, Ky.

ABBOTT, GEORGE E., (s) Home: 1608 Ferndale Place, Ann Arbor, Mich.

ABLOW, CLARENCE M., (m) Mathematician, Engng. Dept., Stanford Research Institute, Menlo Park, Calif. Home: 305 Malcolm Ave., Belmont, Calif.

ABRAMOSKI, JAMES W., (m) Res. Engr., Missile Systems Div., Lockheed Aircraft Corp., Woodley Ave., Van Nuys, Calif. Home 7349 Milwood Ave., Canoga Park, Calif.

ABRAMSON, BERTRAM N., (m) Tech. Staff, Guided Missile Research Division, The Ramo-Wooldridge Corporation, 8820 Bellanca Avenue, Los Angeles 45, California. Home 1742 4th Street, San Pedro, Calif.

ACCASHIAN, JOHN, (s) Stress Analyst, Structures Dept., Redstone Arsenal, U.S. Army Ordnance Corps., Det. B 9330 TV Redstone Arsenal, Huntsville, Ala. Home: 154 Water St., Lawrence, Mass.

ACKER, ALDEN E., (a) President, Hycon Mfg. Company, 2961 East Colorado Street, Pasadena 8, California. Home: 3330 Vosburg Street, Pasadena 8, Calif.

ACKERMAN, ANTHONY T., (s) Field Engineer Jr., Field Engineering Dept., Curtiss-Wright Corp., Wood Ridge, N. J. Home: 570 Grand St., New York 2, N. Y.

ACQUISTO, SALVATORE J., (s) Home: 295 Plymouth, Buffalo 13, N. Y.

ACURIO, JOHN, (a) Assoc. Res. Engr. "A", Engng. Dept., Boeing Airplane Company, Seattle 4, Wash. Home: 1932—8th Ave. W., Seattle 99, Wash.

ACURSO, LOUIS A., (m) Gen. Super Engng., Lynwood Works, Western Gear Corp., 2600 E. Imperial Hwy., Lynwood, Calif. Home: 4233 Alvada Compton, Calif.

ADAIR, GEORGE P., Sr. Partner, Chief Engr., George P. Adair Engng. Co., 1610 Eye St., N.W., Wash., D.C. Home: 194 Norbeck Road, Manor Club, Rockville, Md.

ADAMOWICZ, CHARLES M., (m) Senior Research Engineer, Mechanical Engineering Div., Chicago Midway Laboratories, 6220 S. Drexel Ave., Chicago 37, Ill. Home: 5547 Peck Ave., La Grange, Ill.

ADAMS, CARSBIE C., (m) President, National Research & Development Corp., 41 Peachtree Place, N.E., Atlanta 9, Ga. Home: 219 Little John Trail, N.E., Atlanta 9, Ga.

ADAMS, EDWARD W., (s) Indiana Technical College, 221 E. Washington, Ft. Wayne, Ind. Home: 1522 Maumee Ave., Ft. Wayne, Ind.

ADAMS, HEBRON E., (m) Operations Analyst, Operations Research Office, 7100 Connecticut Avenue, Washington 15, D. C. Home: 5609 Chevy Chase Parkway, Washington 15, D. C.

ADAMS, MAC C., (m) Deputy Dir., Avco Research Lab., Research and Advanced Development Div., Avco Manufacturing Corp., Stratford, Conn. Home: 7 James St., Winchester, Mass.

ADAMS, ROBERT F., (m) Battalion Operations Officer, Headquarters 28th AAA Msl. Bn. (Nike), Fort Lawton, Wash. Home: 614 Ash St., Moscow, Idaho

ADAMS, ROSE A., (m) Prod. Mgr., Lynch, Hart & Stoukton Advertising Co., 25 South Bemiston, Clayton 5, Mo. Home 7365 Westmoreland Dr., St. Louis 5, Mo.

ADAMSON, ARTHUR P., (m) AGT, Div., General Electric Co., Schenectady, N. Y. Home: 410 Terrace Rd., Schenectady 6, N. Y.

ADAMSON, JR. THOMAS C., (m) Ass't. Prof., Aero. Eng. Dept, University of Michigan, Ann Arbor, Mich. Home: 1826 Weldon Blvd., Ann Arbor, Mich.

ADELMAN, BARNET R., Head, Solid Engine Dept., Guided Missile Research Div., Ramo-Woodridge Corp. Los Aangeles, Calif. Home: 5157 Brea Crest Dr., Los Angeles 43, Calif.

ADERTON, THOMAS R., (m) Installation Engineer, Aero Engineering Company, Div. of The Garrett Corp., 220 Old County Rd., Mineola, N. Y. Home: 109 14th Ave., Sea Cliff, N. Y.

AFRICANO, ALFRED, (m) Head, Power Plant Design Dept., Missile Operations, Chrysler Corporation, Box 2628, Detroit 31 Mich. Home: 273 Euclid Ave., Birmingham, Mich.

AFFRUNTI, ANDREW A., (m) Assoc. Res. Engr., Chicago Midway Laboratory, 6220 S. Drexel, Chicago 37, Ill. Home: 3522 W. Flournoy, Chicago 24, Ill.

AGNE, DONALD A., (s) Cartographic Draftsman, Aeronautical Chart & Information Center, 2nd and Arsenal, St., Louis, Mo. Home: 607 E. McKinley St. Belleville, Ill.

AGOSTA, VITO D., (m) Assoc. Prof. Mech. Engng., Polytechnic Inst. of Brooklyn, Brooklyn, N. Y. Home: 324 Taft Road, River Edge, N. J.

AGULIA, RICHARD S., (m) Supervisor Performance Analysis, Rocketdyne, A Division of North American Aviation, Inc., Canoga Pk., Calif. Home: Santa Rita St., Tarzana, Calif.

AHERN, ROBERT E., (m) Sr. Proj. Engr., Engng. Div., Grand Central Rocket Co., Box 111, Redlands, Calif. Home: 311 W. Olive, Redlands, Calif.

AHRENS, DONALD J., (m) Project Engr., Cessna Aircraft Co., Pawnee Plant, Wichita, Kan. Home: 1138 Inverness Dr., Wichita 18, Kan.

ALBANESE, PHILIP, (m) Supervisor, Prelim. Design, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Pk, Calif. Home: 15121 Dickens St., Sherman Oaks, Calif.

ALBERTSON, BENJAMIN S., (a) U. S. Army, 54th Ord. Det. (E.O.D.) Explosive Ordnance Disposal, Ft. Totten, N. Y. C. 59, N. Y. Home: 112 W. 4th St., Lewes, Del

ALBRIGHT, RALPH E., (m) Res. & Dev. Dept., Socony Mobil Oil Co., Paulsboro, N. J. Home: Mullica Hill, N. J.

ALEXANDER, CHARLES M., (s). Home: Route 2, Laurel, Miss.

ALEXANDER, CLAUDE H., (m) Mgr. Product Development, B. F. Goodrich Chemical Co., 2060 E. 9th St., Cleveland 15, O. Home: 1556 8th St., Cuyahoga Falls, O.

ALEXANDER, JOHN D., (m) Staff Engr.-Tech. Res. & Devel. Staff, Pilotless Aircraft, Boeing Airplane Company, P.O. Box 3107, Seattle 14, Wash. Home: 4233 91st N.E., Bellevue, Wash.

ALEXANDER, W. R., (m) Chief Engr., Speco Div., Kelsey-Hayes Wheel Co., 3600 Military Ave., Detroit 32, Mich.

ALLAN, WILLIAM S., (m) Project Engr., The Weatherhead Company, 300 East 131st St., Cleveland 8, O. Home: 16224 Glynn Road, East Cleveland 12, Ohio

ALLEN, FREDERICK H., (s) Polytechnic Inst. of Brooklyn, Brooklyn, N. Y. Home: 25 Summit Place, Glen Cove, N. Y.

ALLEN, GEORGE T., (m) Design Engr., Guided Missiles Div., Republic Aviation Corp., Hicksville, N. Y. Home: 7 Meadowlark Lane, Huntington, N. Y.

ALLEN, PAUL E., (m) Mgr. Quality Control & Customer Service, Beech Aircraft Corp., Wichita, Kan. Home: 5521 E. Orme, Wichita, Kan.

ALLEN, ROBERT W., (m) Design Engr., Jackson China Co., Falls Creek, Penn. Home RD #2, Du Bois, Penn.

ALLIN, KENNETH F., (s) New Mexico State College, Las Cruces, New Mexico. Home: 707 N. Pershing, Truth or Consequences, New Mexico.

ALTIERE, FRED J., (a) R & D Administrator, Fighter Aircraft Division, United States Air Force, W-PAFB, Dayton 3, O. Home: 1597 Seabrook Rd., Dayton 3, O.

ALTMAN, DAVID, (m) Chief, Chemistry & Physics Section, Rockets & Materials Division, JPL, Calif. Inst. of Tech., 4800 Oak Grove Dr., Pasadena, Cal. Home: 2119 Rodney Dr., Los Angeles 27, Cal.

ALVAREZ, RAOUL, (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home 836 Crown Street, Brooklyn, N. Y.

AMAN, ARVIS A, (s) Parks College, E. St. Louis, Ill. Home: 510 Washington St., Fairfield, Ill.

AMELL, RICHARD WM., (s) Rocket Test Tech., Rocket Dept., Bell Aircraft Corp., Box 284, Edwards Air Force Base, Calif. Home: 45520 N. Genoa, Lancaster, Calif.

AMOIA, HENRY, (a) Home: 3152 Fox St., Philadelphia 32, Pa.

AMUNDSEN, EINAR K., (a) Instructor, Academy of Aeronautics, LaGuardia Airport, Flushing, N. Y. Home: 959—78 St., Brooklyn, N. Y.

ANASTOS, PHILIP M., (s) Lehigh University, Bethlehem, Penn. Home: 415½ San Jacinto, Houston, Texas.

ANDERSON, ARTHUR R., (m) Aero. Res. Scientist, Supersonic Prop. Dept. NACA, 21000 Brookpark Road, Cleveland 11, Ohio. Home: 2828 Wooster Rd., Rocky River 16, Ohio

ANDERSON, AUBREY M., (m) Technical Staff, Hughes Aircraft Co., Florence & Teale Sts., Culver City, Calif. Home: 4526 Green Meadows Ave., Torrance, Calif.

ANDERSON, BERT J., Project Engr., Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 3020 El Prado Way, Sacramento, Calif.

ANDERSON, CAPT. CARL A., (m) Institute of Technology, USAF, Wright-Patterson AFB, Ohio. Home: Box 126, Washington Depot,, Conn.

ANDERSON, DALE A., (s) Parks College, E. St. Louis. Ill. Home: R.F.D. 2, Alta, Iowa

ANDERSON, ELMER C., (a) General Supvr., Aircraft Mfgng. Div., Hughes Aircraft Co., Culver City, Calif. Home: 2012W Rosita Ave., Burbank, Calif.

ANDERSON, FRANK P., (m) Chemist, Reaction Dept., Thiokol Chemical Corp., Huntsville, Ala. Home: 519 West Clinton Street, Huntsville, Ala.

ANDERSON, FRANK M., (m) Bureau of Ordnance, Ma3a-2, Washington 25, D. C. Home: Box 22, Gwynedd Valley, Pa.

ANDERSON, GEORGE E. (m) Chief Tech. Engr., Orenda Engines Limited, Box 4015, Terminal "A", Toronto, Ontario, Canada. Home: 682 Glengrove Ave., W, Toronto 10, Ontario, Canada

ANDERSON, HAROLD C. (m) Training Ass't Supervisor, Engng. Training Coordinator, Convair, A Division of General Dynamics Corp., Ft. Worth 1, Texas. Home: 1720 Montrose Dr., Ft. Worth, Texas.

ANDERSON, MILTON D., (m) Aero. Powerplant Dev. Engr., University of Colorado, Boulder, Colo. Home: 610 Fraser Blvd., Huntsville, Ala.

ANDERSON, PAUL E., (m) Ch. Engr. Res. & Dev. Dept., Harvey Machine Co. Inc., 19200 S. Western Ave., Torrance Calif. Home: 1729 Manuel Ave., Torrance, Calif.

ANDERSON, PHILIP N., (m) Structures Design Engr., Ramo-Wooldridge Corp., 8820 Bellanca, Los Angeles 45, Calif. Home: 1170 Fiske St., Pacific Palisades, Calif.

ANDERSON, WILLIAM, (m) Mech. Engr. Home: 41-14 162nd Street, Flushing, L. I.

ANDERSON, WILLIAM G., (m) Head, Machine Des., Sec. B, NACA, Lewis Flight Prop. Labs., 21000 Brookpark Road, Cleveland 11, Ohio. Home: 5915 Thornton Dr., Parma. O.

ANDERTON, DAVID A., (m) Asst. Managing Editor (Technical) Aviation Week, McGraw-Hill Publishing Co., 330 West 42nd Street, New York 36, N. Y. Home: 20 So. Murray Ave., Ridgewood, N. J.

ANDREWS, ARTHUR R. R., (m) Ord. Engr., Douglas Aircraft Co., Redstone Arsenal, Huntsville, Ala. Home: 1831 Veteran Ave., Los Angeles 25, Calif.

ANDREWS JOHN F., (s) Purdue Univ., R.R. No. 5, Monticello, Ind. Home: 1038 Reisner, Indianapolis, Ind.

ANGELL, PIERCE T., (m) Div. Mgr., Accessories Div., Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, Ohio. Home: 3538 Thornapple Lane, Chagrin Falls, Ohio

ANGST, WALTER, (m) Chief Engr., Kollsman Inst. Corp., 8008 45th Ave., Elmhurst, N. Y. Home: 8309 Talbot St., Kew Gardens 15, N. Y.

ANKENEY, D. PHILIP (a) Mech, Engr., Range Des. & Development Branch, Test Dept., USNOTS, China Lake, Code 3083, Michaelson Lab., China Lake, Calif. Home: 2429 Channing Way, Berkeley, Calif.

ANNIS, PRINCE R., (m) Tool and Prod. Planner, Boeing Airplane Co., Seattle, Wash. Home: J-7 Cedar River Park, Renton, Wash.

ANSELM, R. HARVEY, (m) Staff Engr.-Weapons Requirements, Missile Engineering Division, Beech Aircraft Corporation, Wichita 1, Kan. Home: 2638 Grail, Wichita, Kan. Mail: P.O. Box 3034, S. E. Station, Wichita 18, Kan.

ANTHONY, JULIAN C., (m) Commentator, News & Special Events, American Broadcasting—United Paramount, Inc., 7 West 66th St., New York City. Home: 134 Cliff Ave., Pelham, N. Y.

ANTONIADES, ARTHUR J., Research Engineer, Hydraulics, North American Aviation, Inc., International Airport, Los Angeles, Calif. Home: 13004 S. Manhattan Pl., Gardena, Calif.

ANTONIO, ADOLPH L., (m) Gen. Mgr., Chemical Div., The General Tire & Rubber Co., 1725 Englewood Ave., Akron, Ohio. Home 1696 Tanglewood Dr., Akron, Ohio

AOKI, KAZUHIKO, (s) University of Michigan, Ann Arbor, Mich. Home: 702 S. Forest, Ann Arbor, Mich.

APODACA, ALBERT R., (m) Proj. Engr., Aerojet-General Corp., Azusa, Calif. Home: 420 S. Angeleno, Azusa, Calif.

APOLIS, JOHN J., (m) Design Engr., Project Dept., Aerojet-General Corp., Azusa, Calif. Home: 273 E. Benwood St., Covina, Calif.

ARAKI, MINORU SAM, (s) Engr.-Research, North American Aviation, Santa Susana, Calif. Home: 1162 Massachusetts Ave., W. Los Angeles, Calif.

ARAVANTINOS, P. S. M., (s) Home: P. O. Box 35, Washington Bridge Sta., New York 33, N. Y.

ARBUCKLE, PHILIP H., (m) Asst. Project Engr., Advance Design Dept., Glenn L. Martin Co., Box 179, Denver, Colo.

ARCHER, DAVID H., (m) Asst. Prof. Chem. Engr., Carnegie Inst. of Tech., Pittsburgh, Pa. Home: 114 Kentzel Road, Pittsburgh, Pa.

ARCHER, HARRY J., (m) Engr. Consultant, Atlantic Research Corp., 812 N. Fairfax St., Alexandria, Va. Home: 100 Adclare Road, Rockville, Md.

ARENSON, DONALD L., (m) Director Res., Ex-Cel Development Laboratory, 325 West Huron St., Chicago 10, Ill. Home: 1748 Albion Ave., Chicago 26, Ill.

ARGABRITE, ALAN H., (s) 558th Field Artillery Missile Bn. Home: 11836 W. Pico, Los Angeles 64, Calif.

ARGYRIS, THOMAS S. (a) Asst. Prof. Zoology, Syracuse University, Lyman Hall, Syracuse 10, N. Y. Home: 110 Roney Lane, Syracuse 10, N. Y.

ARIES, ROBERT S., (m) Consultant, R. S. Aries & Associates, 270 Park Ave. New York 17, N. Y. Home: Rockland Park, Short Beach, Conn.

ARKIN, HERBERT JR., (s) University of Michigan, Ann Arbor, Mich. Home: 63-33 98th Pl., Forest Hills, N. Y.

ARLINGTON, STERLING F., (s) Design Engng., Warren Webster & Co., 17th & Federal Sts., Camden, N. J. Home: 2113 S. Howard St., Phila. 48, Pa.

ARMSTRONG, JR. AIKMAN, (m) Engng. Representative, Aerojet-General Corp., Azusa, Calif. Home: 3450 Fairpoint St., Pasadena, Calif.

ARMSTRONG, DON L., (m) Director Chem. Dept., Solid Engine and Chem. Div., Aerojet-General Corp., Azusa, Calif. Home: 818 Chester Rd., Covina, Calif.

ARMSTRONG, NEIL A., (m) Electronics Engr., Reeves Instrument Corp., 215 East 91st Street, N. Y., N. Y. Home: Holland Patent, N. Y.

ARMSTRONG, NEIL A., Aero. Res. Pilot, High Speed Flight Station, NACA, P.O. Box 273, Edwards, Calif. Home: 729 Gayley, L. A. 24, Calif.

ARNAUD, JEAN, Asst. Air Attache, French Embassy, 1759 R St., N.W., Washington, D. C.

ARNER, GEORGE R., (m) Aero. Eng., Naval Air Development Center, Johnsville, Pa. Home: 3413 Azalea Ave., Penn Valley Terrace, Langhorne, R.D. 3, Pa.

ARNOLD, ARTHUR K., (m) Rocket Engine Division, Rolls-Royce Ltd., Nightingale Road, Derby, England. Home: 112 Normanton Lane, Littleover, Derby, England

ARTHUR, DOGAN H., (a) Aircraft Sales Mgr., Aircraft Sales Department, Aeroquip Corporation, 300 S. East Ave., Jackson, Mich. Home: 1613 Herkimer Dr., Jackson, Mich.

ARNOLD, J. ELWOOD, Manager, Convair, A Division of General Dynamics Corp., Daingerfield, Tex. Home: Box 735, Daingerfield, Tex.

ARNOLD, JAMES S., (m) Physicist, Stanford Research Inst., Stanford, Calif. Home: 700 Alester, Palo Alto, Calif.

ARTLEY, GORDON E., (m) Southeastern Reg. Rep., Aerojet-General Corporation, 410 Russel Erskine Bldg., Huntsville, Ala. Home: 1212 Pratt Ave., Huntsville, Ala.

ASH, ARTHUR B., (m) Manager, Res. & Dev. Section, Turbo Engng. Dept., American Machine & Foundry Co., 12270 Montague, Pacoima, Calif. Home: 8435 Sylmar Ave., Panorama City, Calif.

ASHLEY, EUGENE, (m) Prod. Design Engr., Aircraft Products Dept., General Electric Co., Lakeside Ave., Burlington, Vt. Home: 15 Ivy Lane, Burlington, Vt.

ASHMEAD, RICHARD R., (m) Group Leader, Turbomachinery, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 22232 Cass Ave., Woodland Hills, Calif.

ASPELIN, LESLIE L., (m) Engng. Manager, Accessories Div., Dev. Engr. Dept., Thompson Products, 23555 Euclid Ave., Cleveland, O. Home: 1260 Quilliams Rd., Cleveland, O.

ASPINWALL, ROBERT H., (m) Sr. Proj. Engr., Advance Engine Design, Allison Div.-General Motors, Indianapolis, Ind., Home: 3109 N. Webster, Indianapolis, Ind.

ATKINS, KENNETH L., (s) Parks College, East St. Louis, Ill. Home: 2414 Ong St., Amarillo, Texas

ATKINSON, MARY L., (a) Jr. Engr., Boeing Airplane Co., Plant 2, Seattle, Wash. Home: 4733—17th St., N.E., Seattle 5, Wash.

ATKINSON, RUSSELL S., (m) Contracts Mgr., Lear Romec Div., Lear, Inc., 1430 Abbe Rd., Elyria, Ohio. Home: 140 Berkeley Rd., Elyria, Ohio.

ATKISSON, JAMES B., (m) Mgr. Mechanics, Mechanics Department, J. P. L., Calif. Institute of Tech., 4800 Oak Grove Drive, Pasadena 3, Calif. Home: 2604 E. Villa St., Pasadena 8, Calif.

ATRAN, CHARLES W., (a) Jet Aircraft Inspector, U.S.A.F., George A.F.B., Calif. Home: 100 Nisqually Road, Apple Valley, Calif.

ATTIAS, JOHN J., (m) Member, Tech. Staff, Prop. Dept., The Ramo-Wooldridge Corp., 5760 Arbor Vitae, Los Angeles 45, Calif. Home: 2452 Woodbyn Road, Pasadena, Calif.

AUGOST, ARTHUR, (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 1553 Bryant Ave., Bronx 60, N. Y.

AUGART, PAUL T., (s) Brooklyn Polytechnic Inst., 99 Livingstone St., Brooklyn, N. Y. Home: 33-23 58th St., Woodside 77, N. Y.

AUGUSTINE, PAT R., (a) Atomic Reactor Engr., Commercial Atomic Power, Westinghouse Electric Co., P.O. Box 355, Pittsburgh 30, Pa. Home: 4865 E. Broadway, Tucson, Ariz.

AUGUSTYNIEWICZ, STANLEY W. (s) Parks College, East. St. Louis, Ill. Home: 8342 Colfax Ave., Chicago 17, Ill.

AURAND, HENRY S., JR., (m) Asst. Proj. Engr., Missiles Engr. Dept., Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 450 Puerto Del Mar, Pacific Palisades, Calif.

AYERS, MILTON E. (m), Public Relations, Industrial and Public Relations Division, Reaction Motors, Inc., Denville, N. J. Home 197 West Passaic Ave., Bloomfield, N. J.

Wooldridge Corp., 5760 Arbor Vital, Los Angeles 45, Calif. Home:

B

BABINGTON, EMERSON LEE, (a) Tool & Cutter Grinder, Gas Turbine Div., General Electric Co., Evendale, O. Home 812 Mann Place, Cincinnati, O.

BACHLE, CARL F., (m) Vice Pres., Research Dept., Continental Aviation & Engng. Corp., 12700 Kercheval, Detroit 15, Mich.

BACQUIE, GUY O., (a) Res. Mechanic, North American Aviation, Inc., International Airport, Los Angeles, Calif. Home: 21517 Saticoy St., Canoga Park, Calif.

BACKLUND, CARL V., (m) Physicist, Ballistic Research Laboratories, Aberdeen Proving Ground, Aberdeen,Md. Home: 315F Augusta, Aberdeen, Md.

BADER, HENRY JR., (m) Liaison Engineer, Mira Corporation, Missile Operations, Chrysler Corporation, Box 2628, Detroit 21, Mich. Home: 1904 Evergreen St., Huntsville, Ala.

BADER, MICHAEL H., (a) Attorney, Haley, Doty & Wollenberg, 1735 De Sales N.W., Washington 6, D. C. Home: 1741 No. Troy, Arlington, Va.

BADGER, F. SIDNEY, Jr., (m) Vice President, Director of Research, Haynes Stellite Co., 50 Lindsey St., Kokomo, Ind. Home: 209 Forest Dr., Kokomo, Ind.

BAETZ, HAROLD F., (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 908 Van Duzer St., Staten Island, N. Y.

BAGGETT, PHILIP J., (s) Purdue University, 302 W. Stadium, W. Lafayette, Ind.

BAGLEY, BRUCE R., (a) Vice Pres., Yale Stamping Co., 19055 W. Davison, Detroit 23, Mich. Home: 18475 Appoline, Detroit 35, Mich.

BAGLEY, CHARLES S., (m) Cartographer, Holloman Air Development Center, Holloman Air Force Base, N. M. Home: 1314 Ohio Ave., Alamogordo, N. M.

BAGNALL, LESLIE M., (m) Nuclear Engr., Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 5840 Coleman St., Ft. Worth 14, Tex.

BAHN, GILBERT S., (m) Sr. Thermodynamics Engr., Long Range Planning & Research Div., Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 22816 Pacific Coast Highway, Malibu, Calif.

BAILER, EDWARD R., (m) Expediter-Investigator, Wheatfield Div., Bell Aircraft Corp., Niagara Falls Blvd., Wheatfield, N. Y.

BAILEY, D. K., (m) Scientific Director, Page Communications Engineers, Inc., 710—14th St., Washington 15, D. C. Home: 5415 Connecticut Ave., N.W., Washington 15, D. C.

BAILEY, FRANK A., (a) Lab Tech., Bendix Aviation Corp., Hamilton, O. Home: 303 N. 3rd St., Hamilton, O.

BAILEY, ROBERT S., (m) Assoc. Director, Guided Missile Laboratory, Federal Telecommunication Laboratories, 492 River Road, Nutley, N. J. Home: 151 Bergen Ave., Waldwick, N. J.

BAISLEY, W. J., (m) Supervisor, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 9410 Encino Ave., North Ridge, Calif.

BAKER, CARL F., (m) Quality Manager, Hamilton Standard Div., United Aircraft Corporation, Windsor Locks, Conn. Home: 53 Rumford St., West Hartford, Conn.

BAKER, DWIGHT, (m) Senior Engineer Research Rocketdyne, A Division of North American Aviation, Canoga Park, Calif. Home: 2217 Dela Osa, Woodland Hills, Calif.

BAKER, LOUIS, Jr., (m) Aero. Res. Scientist, Rocket Branch, NACA, 21000 Brookpark Rd., Cleveland 11, O. Home: 13421 Merl Ave., Lakewood 7, O.

BAKER, NORMAN L., (m) Indiana Tech. College, Ft. Wayne, Ind. Home: 2037 Nuttman Ave., Ft. Wayne, Ind.

BAKER, ROBERT L., (s) Home: 12 Mt. Auburn St., Cambridge, Mass.

BAKOW, LEON, (s) Student, Indiana Technical College, Ft. Wayne, Ind. Home: 221 East Washington Blvd., Ft. Wayne, Ind.

BALL, JAMES R., (m) Design Engr., Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 7109 Eagle Rd., Fair Oaks, Calif.

BALL, LAURENCE M., (m) Chief Laboratories Engineer, Engineering Div., Missile Branch, Chrysler Corporation, P. O. Box 2628, Detroit 31, Mich. Home: 1040 Chesterfield Rd., Birmingham, Mich.

BALL, PETER C., (m) Mech. Engr., Engineering Div., Chrysler Corporation, Detroit 31, Mich. Home: 14530 Bishop Oak Park 37, Mich.

BALLER, HOWARD, (a) Manager, Mechanical Div., General Mills, Inc., 2003 E. Hennepin Ave., Minneapolis, Minn. Home: 5040 Park Ave., Minneapolis 17, Minn.

BALTAZOR, ALBERT A., (m) Owner, The Baltazor Co., 5215 St. Bernard Ave., New Orleans 22, La.

BANDETTINI, ANGELO, (m) Aero. Res. Scientist, Ames Lab., NACA, Moffett Field, Calif. Home: 644 Alma St., Mountainview, Calif.

BANE, JAMES C. Jr., (s) Carnegie Institute of Technology, Pittsburgh 13, Penna. Home 800 Duncan Ave., Washington, Penna.

BANKSTON, LESTER T., (m) Proj. Engr., Applied Research Division, Propellants & Explosives Department, Naval Ordnance Test Station, Michelson Lab., China Lake, Calif. Home 51 B. Franklin, China Lake, Calif.

BANNAN, BERNARD J., (m) Vice Pres., Gen. Mgr., Western Gear Corporation, 2600 E. Imperial Hwy., Lynwood, Calif. Home: 1000 Buena Vista, South Pasadena, Calif.

BANUS, M. DOUGLAS, (m) Director Res. and Devel. Labs., Metal Hydrides, Inc., Congress St., Beverly, Mass. Home: High St., Topsfield, Mass.

BARICHIVICH, ANTHONY C., (m) Physicist, W. S. Signal Corp Agency, WSPG, New Mexico. Home: 567 W. Brown Rd, Las Cruces, New Mexico.

BARIFFI, HERBERT F., (m) Tech. Staff, Electronics Dept., Hughes Aircraft Co., Culver City, Calif. Home: 7336-D West Manchester Blvd., Los Angeles 45, Calif.

BARKAN, MARVIN D., (s) N. Y. U. College of Engng., University Heights, Bronx 53, N. Y. Home: 136-70 72nd Ave., Kew Gardens Hills 67, N. Y.

BARKER, CALVIN L. R., (s) Res. Engr., Air-Fuel Combustion, JPL, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, Calif. Home: 185 S. Greenwood, Pasadena, Calif.

BARKER, WALTER M., (s) Purdue University, Box 51, Cary Hall, Purdue University, West Lafayette, Ind. Home: Dayton, Ind.

BARKLEY, JOHN E., (a) Manager, General Mills, Inc., 2003 East Hennepin Ave., Minneapolis 13, Minn. Home: 1630 Ridgewood La., St. Paul 13, Minn.

BARNER, WILLIAM H., (a) Sales & Devel. Engr., Engng. Dept., Reinhold Engng. & Plastics, 12827 E. Imperial, Norwalk, Calif., Home: 11412 Biscayne Blvd., Anaheim, Calif.

BARNES, CLARENCE E., JR., (a) Sr. Supervisor, Production Illustration Group, Boeing Airplane Co., Wichita, Kan. Home: 1122 Inverness, Wichita 18, Kan.

BARNES, ELLIS H. Jr., (a) Mech Assoc., Egli and Gompf, Inc., 1019 N. Calvert St., Baltimore 2, Md. Home: 3726 Cedar Dr., Baltimore 7, O.

BARNEY, JOHN D., (m) Design Engr., Product Development Dept., Aerojet-General Corporation, Azusa, Calif. Home: 1560 N. Michigan Ave., Pasadena, Calif.

BARNOCKY, JOSEPH S., (m) Electronic Engineer, Glenn L. Martin Co., Box 179, Denver 1, Colo.

BARONE, MARTIN J., (m) Flight Test Engr., Dept. 6-7, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 7315 Ewing Ave., Ft. Worth, Tex.

BARR, BRADFORD F., (s) University of Michigan, Ann Arbor, Mich. Home: 1000 Oakland, Ann Arbor, Mich.

BARR, FAY H., (m) Instrumentation Project Coordinator, A. F. Flight Test Center, Edwards A. F. B., Calif. Home: 111-8th St., Edwards, Calif.

BARR, IRWIN R., (m) Chief Ordnance Engr., Ordnance Dept., Aircraft Armaments Inc., Cockeysville, Md. Home: Chapman Rd., Kingsville, Md.

BARR, ROBERT A., (m) Sales Mgr., Refractories Div., Carborundum Co., Perth Arboy, N. J. Home: 867 River Rd., Fair Haven, N. J.

BARR, WILLIAM J., (m) Asst. Research Director, Research Division, Detroit Controls Corporation, 1750 Broadway, Redwood City, Calif.

BARRETT, ERNEST M., (m) Research Engineer, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8928 Rathburn Ave., Northridge, Calif.

BARRETT, JAMES, (s) N. Y. University, University Heights, Bronx 53, N. Y. Home: 82 Wadsworth Ave., N. Y. 33, N. Y.

BARRINGER, ELMER E., (m) Electronic Engineer, Missile Test Equipment Design, Hughes Aircraft Co., Tucson, Ariz. Home: 4612 E. Eastland, Tucson, Ariz.

BARRY, WILLIAM V., Petroleum Engineer, Production Dept., Creole Petroleum Corp., Lagunillas, Venezuela

BARTEN, HENRY J., Chief, Mechanics Section, Field Engineering Group, Chicago Midway Laboratories, Eglin Air Force Base, Fla. Home 21 Okahatches Circle, Ft. Walton B'ch, Fla.

BARTER, JOHN W., (m) USAF, Strategic Air Command, Box 366, Patrick AFB, Fla. Home 339 Seminole Dr., Eau Gallie, Fla.

BARTLEY, CHARLES E., (f) President, Grand Central Rocket Co., P. O. Box 111, Redlands, Calif. Home: 1902 Verde Vista Dr., Redlands, Calif.

BARTON, WILLIAM A., (m) Director, Sales & Contracts, Genisco, Inc., 2233 Federal Ave., Los Angeles 64, Calif. Home: 2214 Montana Ave., Santa Monica, Calif.

BARZELAY, ARTHUR R., (m) Div. Engr., Design Division-Defense Products Dept., M. W. Kellogg Co., Danforth Ave., Jersey City, N. J. Home: 121 Seminary St., Bergenfield, N J.

BARKAN, MARVIN D., N. Y. U. College of Engng., University Heights, Bronx 53, N. Y. Home: 136-70 72nd Ave., Kew Gardens Hills 67, N. Y.

BASHAM, SAM J., Jr., (m) Mechanical Engineer-Research, Battelle Institute, Engineering Mechanics Division, 505 King Ave., Columbus, O. Home: 3558 Briggs Rd., Columbus 4, O.

BASS, JOHN R., Lt. USN, Naval Dept., Bureau of Ordnance, Washington 25, D. C. Home: 511-26th Rd., South Arlington 2, Va.

BASS, ROBERT W., (a) Res. Assist., Dept. of Mathematics, Princeton University, Princeton, N. J. Home: 8-B Sergeant, Princeton, N. J.

BASSETT, DENISON S., (m) Operations Section Head, Propulsion Department, Hughes Aircraft Co., Florence & Teale, Culver City, Calif. Home: 341 Sixth St., Manhattan Beach, Calif.

BASTRESS Pr., E. KARL, (a) Engr., Metallurgical Res., Air Reduction Co., Inc., Murray Hill, N. J. Home: 29 Coleridge Rd., Short Hills, N. J.

BATCHELDER, GEORGE W., (a) Prin. Chemist, Grand Central Rocket Co., 1946 Mentone Blvd., Mentone, Calif. Home: 422 W. Alosta Ave., Glendora, Calif.

BATEMAN, ROBERT L., (m) Director, Prod. Develop., Carbide Carbon Chemical Co., 30 E. 42nd St., New York 17, N. Y. Home: 331 Park Ave., Manhasset, N. Y.

BATES, CURTIS L., (m) Assist. Chief Engr., Engng. Dept., Ryan Aeronautical Company, Lindbergh Field, San Diego 12, Calif. Home: 1411 Savoy Cir., San Diego 7, Calif.

BAUER, NORMAN D., (m) Propulsion Systems Supervisor, Cessna Aircraft Co., Wichita, Kan. Home: 425 Maple Lane, Wichita, Kan.

BAUER, RICHARD L., (m) Assistant Supervisor—Engng., Engng Dept., Western Gear Corporation, 2600 E. Imperial Hwy., Box 192, Lynwood, Calif. Home: 8518 S. Lowman, Rivera, Calif.

BAUM, CHARLES N., (m) Junior Test Engineer, Wright Aeronautical Div., Curtiss-Wright Corp., Wood Ridge, N. J. Home: 1000 Grand Concourse, New York 66, N. Y.

BAUMAN, RALPH E., (m) Electrical Engineer, Engineering Dept.—Air Arm, Westinghouse Electric Co., Friendship International Airport, Baltimore, Md. Home: 1715 W. 91 St., Chicago 20, Ill.

BAUMAN, ROBERT, (s) Revisions Grp., Grumman Aircraft Eng. Corp., Bethpage, L. I., N. Y. Home: 1905—22 Rd., L. I. City 5, N. Y.

BAUMANN, ROBERT C., (m) Project Vanguard, Naval Research Laboratory, Code 4115B, Washington 25, D. C. Home: 9 West Uhler Ave., Alexandria, Va.

BAXTER, ALBERT N. Jr., (a) Proj. Engr., Ramo Wooldridge Corp., 5800 Arbor Vitae, Los Angeles 45, Cal. Home: 9101 S. Hastings St., Los Angeles 45, Cal.

BAYNE, WALTER M., Supervisor, Rocketdyne, A Division of North American Aviation, Inc., Canoga Ave. & Van Owen, Canoga Park, Calif. Home: 22034 Dela Osa St., Woodland Hills, Calif.

BAYSTON, JOHN R., Engineering Consultant, Heat Exchange Dept., Uniflow Mfg. Co., Erie, Pa. Home: 3908 Lewis Ave., Erie, Pa.

BAZZANO, JOSEPH T., (a) Pratt & Whitney Aircraft, East Hartford, Conn. Home: 298 Fairfield Ave., E. Hartford, Conn.

BEALE, ROBERT J., (m) Rocket Propulsion Engr., Glenn L. Martin Company, Baltimore 3, Md. Home: 1602 Thetford Rd., Baltimore 4, Md.

BEAN, STEWART P., (m) Assist. Chemist, Physical Science Lab., Box 548, State College, N. M. Home: Box 424, State College, N. M.

BEANS, E. WILLIAM, (m) Engr., North American Aviation, Inc., Columbus, O. Home: 1654 E. Broad St., Columbus, O.

BEARDSLEY, FERRIS P., (m) Asst. Mgr. Marketing, Defense & Ind. Prod., Alco Products, Inc., Erie Blvd., Schenectady, N. Y. Home: 212 Rosa Rd., Schenectady 8, N. Y.

BEATRICE, JOSEPH V., (a) Design Draftsman, Sales Corporation of America, Dresher, Pa. Home: 752 Sandy St., Norristown, Pa.

BEATTIE, RICHARD M., (m) Senior Engineer, Aerojet-General Corporation, Azusa, Calif. Home: 3565 Shadow Grove Rd., Pasadena 8, Calif.

BEATTY, DONALD F., (s) St. Procopius College, Lisle, Ill.

BEAUCHAMP, FRANK W., (m) Exec. Vice Pres., Electro Mechanical Products Co., 32700 Ford Rd., Garden City, Mich.

BEAUCHAMP, JACK M., (m) Northeastern Reg. Rep., Aerojet-General Corp., Azusa, Calif. Home: 16 Mesa Rd., Hicksville, L. I., N. Y.

BEAUCHAMP, JACK M., (m) Pres., Electro Mechanical Products Co., 32700 Ford Rd., Garden City, Mich.

BECKER, RANDOLPH A., (m) Physicist, Flight Determination Laboratory, Systems Engineering Branch, White Sands Proving Ground, Las Cruces, N. M. Home: 1913 Alaska Ave., Alamogordo, N. M.

BECKER, WALTER, (s) Home: 121 Standard St., Syracuse, N. Y.

BEDINGER, JOSEPH A., President, Bedinger Products Corp., 310 Lovers Lane, Alamogordo, N. M.

BEEBE, FRED, G., (a) Supervisor Mfgng. Control, Research & Development, Rheem Manufacturing Co., 11711 Woodruff Ave., Downey, Calif. Home: 7722 Allengrove, Downey, Calif.

BEEBE, MURRAY C., (m) Head, Propulsion Dept., Guided Missile Research & Development Div., Hughes Aircraft Company, Florence & Teale, Culver City, Calif. Home: 1 Spur Lane, Rolling Hills, Calif.

BEENE, JAMES L., (s) Inland Testing Laboratory, Cook Electric Company, 2700 N. Southport, Chicago, Ill. Home: 743 Buckingham Pl., Apt #32, Chicago 13, Ill.

BEERER, JOSEPH G., (m) Gen. Mgr., Missile Development Division, North American Aviation, Inc., 12214 Lakwood Blvd., Downey, Calif. Home: 965 East Philadelphia St., Whittier, Calif.

BEIGHLEY, CLAIR M., (m) Sr. Engr., Liquid Rocket Plant, Aerojet General Corp., Sacramento, Calif. Home: 4609 Fair Oaks Blvd., Fair Oaks, Calif.

BELL, E. BARTON, (a) Aero. Engr., Program Control Office, Directorate of Systems, Management Hq. ARDC, United States Air Force, WPAFB, O. Home: 214 W. Ridgeway Rd., Centerville, O.

BELL, CARROLL L., (m) Proj. Eng., Texas Metal and Manufacturing Co., Inc. 6114 Forest Park Rd., Dallas Tex.

BELL, GILBERT L., (m) Engng. Group Supervisor, Propulsion Section, JPL, California Inst. of Tech., 4800 Oak Grove Dr., Pasadena, Calif. Home: 726 W. Newgrove, Lancaster, Calif.

BELL, JOSEPH H., (m) Design Engr., Test Division, Aerojet General Corp., Box 1947, Sacramento, Cal. Home: 6715 Lincoln, Carmichael, Cal.

BELL, LAWRENCE D., (f) President, Bell Aircraft Corporation, P. O. Box 1, Buffalo 5, N. Y. Home: 925 Delaware Ave., Buffalo 9, N. Y.

BELL, MARION WETHERBEE JACK, Engineer, Design, Power Plant Test and Development, North American Aviation, Inc., 4300 E. 5th Ave., Columbus, O. 989 E. 26th Ave., Columbus 11, O.

BELLAIS, CHARLES E., (m) D300K Crew Chief, Solid Propellant Branch, Rocket Vehicle Q Warhead Lab, EML, WSPG, N. M. Home: 1713 Calle Felis, Las Cruces, N. M.

BELLAMY, CHARLES W., (m) Sr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 6633 Yolanda Ave., Northridge, Calif.

BELLER, GORDON M., (m) Group Engineer, Northrop Aircraft Inc. Hawthorne, Calif. Home: 724 Greentree Rd., Pacific Palisades Calif.

BELLER, WILLIAM S., (m) Managing Editor, Aero Digest Magazine Aeronautical Digest Publishing Corp., 1143 National Press Bldg., Washington 4, D. C. Home: 333 South Glebe Rd., Arlington, Va.

BELLIS, HOWARD E., (m) Tool Engr., Tooling Dept., Hughes Aircraft Co., Nogales Highway, Tucson, Ariz. Home: 5823 E. 19th St., Tucson, Ariz.

BELSCH, JOHN J., (a) TMC, U.S.N., 3923 Box 6, FPO, San Francisco, Calif. Home: 4609 Aden Moor Ave. Long Beach, Calif.

BELTRAN, HENRY, (s) Indiana Technical College, Ft. Wayne, Ind.

BELTRAN, MICHAEL R., (s) Brooklyn Technical High School, 29 Ft. Greene Pl., Brooklyn 17, N. N. Home 1133 East 35th St., Brooklyn 10, N. Y.

BENDER, EUGENE H., (m) General Manager, Bender Wholesale Co., 815 Main St., Rapid City, So. Dak. Home: 1003 Eleventh St., Rapid City, So. Dak.

BENDER, RUDOLPH A. III, (s) Ohio State University, 227 E. 15th Ave., Columbus, O. Home: 53 Gramercy Park, Rochester 10, N. Y.

BENDER, WILLIAM H., (m) Sr. Operations Research Engr., Temco Aircraft Corp., Dallas, Tex. Home: 3205 Binyon, Ft. Worth, Tex.

BENDERSKY, CHARLES, (a) Assistant Project Engineer, Thrust Chamber Department, Reaction Motors, Inc., Denville, N. J. Home: 1049 Fox St., Bronx 59, N. Y.

BENDITZKY, EDGAR, (m) Sr. Field Engr., Rome Air Force Depot, Rome, N. Y., National Scientific Labs. Inc., 2010 Mass. Ave., N.W., Washington 6, D. C. Home: Box 1124, Hazelton Branch, Rome, N. Y.

BENEDICT, DONALD B., (m) Vice Pres., Research, Development & Fibers, Carbide and Carbon Chemical Co., 30 E. 42nd St., N. Y. C.

BENEDICT, GEORGE W., (m) Manager, N. Y. Office, North American Aviation, Inc., 19 Rector St., N. Y. 6, N. Y.

BENHAM, THEODORE F., (m) Res. Eng., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 16552 Rinaldi St., Granada Hills, Calif.

BENNER, RALPH W., (m) USAF, P. O. Box 262, Inglewood, Calif. Home: 3 N. 5th St., Perkasie, Pa.

BENNETT, KELLY R., (s) University of Calif. at Los Angeles, College of Engineering, Los Angeles 34, Calif. Home: 3666 Glendon Ave., Los Angeles 34, Calif.

BENSON, JAMES A., (m) Service Engineer, Field Service, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 14753 Otsego St., Van Nuys, Calif.

BENTLEY, WILLIAM, (s) 1525 Highland Ave., Wilmette, Ill.

BERESFORD, DONALD D. B., (s) Mechanical Engr., Fairfield Shipbuilding & Eng. Co., Govan Glasgow S.W-1 Co., Scotland. Home: 91 Houston St., Glasgow C-5., Scotland.

BERGAUST, ERIK, (m) American Aviation, 1025 Vermont Ave., N. W. Washington 5, D. C. Home: 802 So. Florida St., Arlington, Va.

BERGER, OTTO, (m) Sr. Electro-Mech. Engr., Electro-Mechanical Dept. Project Vanguard, Glenn L. Martin Co., Baltimore 3, Md., Home: 6154 Chinquepin Pkwy, Baltimore 12, Md.

BERGVALL, ROYAL C., (m) Engr. Mgr., Defense Prod., Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Penna.

BERKE, HAROLD, (m) Rocket Data Analysis Engineer, Bell Aircraft Corporation, Rocket Engine Dept., Box 1, Buffalo, N. Y. Home: 26 Norwalk Ave., Buffalo 16, N. Y.

BERL, WALTER G., (m) Chemist, Johns Hopkins University, Applied Physics Lab., 8621 Georgia Ave., Silver Spring, Md. Home: 4 Bay Tree Lane, Washington 16, D. C.

BERLINER, WM., (m) Proj. Engr., Cincinnati Div., Allstates Engineering Co., 6459 Kennedy Ave., Cincinnati 13, O. Home: 9860 Winton Rd., Cincinnati 15, O.

BERMAN, KURT, (m) Act. Supervisor-Combustion Devel. Unit- Advanced Engng., Rocket Section, General Electric Company, Malta Test Station, Ballston Spa, N. Y. Home: 22½ Union Ave., Schenectady 8, N. Y.

BERNSTEIN, ABE, (m) Director, Rocket Launcher Devel., Research & Development Dept., Heintz Mfg. Co., Front St. & Olney Ave., Philadelphia 20, Pa. Home: 541 Glenview St., Philadelphia 11, Pa.

BERNSTEIN, BORIS A., (a) Development Engineer, Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 2404 Upham Court, Carmichael, Calif.

BERRY, EDWIN R., (a) Prop. Engr., Prop. Res. Group, Convair, A Division of General Dynamics Corp., Grant's Lane, Ft. Worth, Tex. Home: 1906A Hervie, Ft. Worth 7, Tex.

BERRY, HARVEY H., (m) Sr. Engr., Advanced Devel. Group, Crosley Div., Avco Mfg. Co., Glendale-Milford Rd., Cincinnati 37, O. Home: 1859 Chaucer Dr., Cincinnati 37, O.

BERRY, WALTER L., JR., (m) Des. Engr., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 1814 Berkley Ave., Bessemer, Ala.

BERT, CHARLES W. III, (m) Aero Design Engr., Fairchild Engine and Airplane Corp., Hagerstown, Md. Home: 412 E. Baltimore St., Greencastle, Pa.

BERTIN, LEONARD, (m) Reporter, The Daily Telegraph, 135 Fleet St., London, E.C. 4, England.

BERTRANDO, BERTRAND R., (m) Group Leader, Missile Power Plants, Missiles Engineering, Douglas Aircraft Company, 3300 Ocean Pk. Blvd., Santa Monica, Calif. Home: 2855 Devonport Rd., San Marino, Calif.

BERUS, EDWARD R. (m) Physicist, Defense Research, Firestone Tire & Rubber Co., Akron, O. Home: 840 Work Dr., Akron 20, O.

BEST, BUSHNELL, (m) Test Engineer, Rocket Lab., Bell Aircraft Corp., Buffalo, N. Y. Home: P. O. Box 315, Ransomville, N. Y.

BESWICK, RICHARD, (s) Univ. of Buffalo, Buffalo, N. Y. Home: 22 Mountain Ave., Warrensburg, N. Y.

BETTS, ROBERT EARL, (m) Chemical Engr., Redstone Arsenal, Huntsville, Ala. Home: 402 E. Holmes, Huntsville, Ala.

BEVELHEIMER, BRUCE L., (s) University of Michigan, Ann Arbor, Mich. Home: 3734 Mayfair, Dearborn, Mich.

BEVERAGE, ALLAN D., (m) Rocket Engine Planning Engr., Aircraft Gas Turbine Devel. Dept., AGT Div., General Electric Company, Cincinnati 15, O. Home: Rt. 2, Box 291, Sharonville, O.

BEVINS, JAMES E., (m) Chief Mechanical Engineer, Eclipse-Pioneer Div., Bendix Aviation Corporation, Teterboro, N. J. Home: 42 Morton Dr., Ramsey, N. J.

BIGELOW, EDWARD B., (s) Purdue University, 234 Litteton Ave., W. Lafayette, Ind. Home: 2151 Oaks Dr., Burlingame, Calif.

BIGNON, ANDRE P., (m) Res. Engr., Missile Sys. Div., Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 18627 Keswick Ave., Van Nuys, Calif.

BILLHEIMER, JOHN S., (m) Devel. Engr., Solid Engine Dept., Aerojet-General Corp., Azusa, Calif. Home: 2735 Winrock Ave., Altadena, Calif.

BILLINGS, BRUCE H., (m) Vice President and General Manager, Baird Associates, Inc., 33 University Rd., Cambridge 38, Mass. Home: Juniper Ridge Rd., Lincoln, Mass.

BINELL, WALTER D., (s) Elec. Engr., Semi-Conductor, Lansdale Tube Company, Church Rd., Lansdale, Pa. Home: 581 Timpson Pl., Bronx 55, N. Y.

BINET, LUDGER J., (a) General Manager, Charles F. Hires Co., 402 Occidental Ave., Seattle 4, Wash. Home: 911 Summit Ave., Seattle 4, Wash.

BINDON, GUY A. J., Parks College of Aero. Tech., E. St. Louis, Ill. Home: 301 Queen Wilhelmina Ave., Pretoria, South Africa

BINGHAM, JAMES J., Manager, Aircraft Engines, Aviation & Defense Industries Sales, General Electric Co., 1801 N. Lamar St., Dallas, Tex. Home: 11016 Snow White Dr., Dallas, Tex.

BIRCHAK, FRANCIS J., (s) A&E Mechanic Tech. School, U.S.A.F., Amarillo AFB., Tex. Home Rd 2, Box 370, Latrobe, Penna.

BIRRER, LLOYD G., Proj. Engr., Engng. Dept. Interstate Engng. (m) Corp., 2250 E Imperial Hwy, El Segundo, Calif. Home: 211 E. 134 St., Hawthorne, Calif.

BISSELL, HOWARD R., (m) Senior Field Engr., Engng., Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 2901 Olive Pl., Ft. Worth, Tex.

BJORKMAN, JOHN W., (m) Sales Mgr., Sales Dept., Contracts Division, The W. L. Maxson Corporation, 475 10th Ave., New York, N. Y. Home: 18 Crest Rd., New Hyde Park, N. Y.

BLAIR, EDWARD A., (m) Leadman, Publications Group, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 17-A Bayshore Ave, Belmont Shore, Long Beach, Calif.

BLACK, FRANK R., (a) Engr., Glenn L. Martin Co., Baltimore, Md. Home: House #8, San Sea Gardens, York Rd 1, Towson 4, Md.

BLACKMAN, ARTHUR W., JR., (m) Res. Engr., United Aircraft Corp., E. Hartford, Conn. Home: 2 Stephen St., Manchester, Conn.

BLAIR, PHILIP M., (s) Assistant Professor of Thermodynamics and Heat Power, Robert College Engineering School, Bebek P.K. 8, Istanbul, Turkey. Home: Cinar House, Robert College, Bebek P.K. 8, Istanbul, Turkey.

BLAIR, ROBERT G. (s) Dartmouth College, 307 N. Massachusetts Hall, Hanover, N. H. Home: 79 W. Wayne, Maumee, O.

BLAKE, T. GAYNOR, (m) Research and Development Manager, Explosives Division, Olin Mathieson Chemical Corporation, East Alton, Ill. Home: Box 208 R.R. 2, Florissant, Mo.

BLANCHARD, PHILLIP W., (s) Purdue Univ., Lafayette, Ind. Home: 10 Moody St., Amesbury, Mass.

BLANTON, JOHN W., (m) Turbine Pump Group Leader, Bell Aircraft Corporation, P.O. Box 1, Buffalo 5, N. Y. Home: 53 Hamline Rd., Buffalo 8, N. Y.

BLATZ, PAUL J., (m) Technical Specialist, Solid Engine, Aerojet-General Corp., Irwindale Rd., Azusa, Calif. Home: 803 Amador St., Claremont, Calif.

BLAYLOCK, RAYMOND C., (m) Vice Pres.-Engng., Engineering Department, Chance Vought Aircraft, Inc., P. O. Box 5907, Dallas 22, Tex. Home: 4371 Druid Lane, Dallas, Tex.

BLEICH, HANS H., (m) Director, Institute of Flight Structures, Columbia University, New York 27, N. Y.

BLEVINS, KENNETH L., (m) Devel. Eng. Prod., Aircraft Gas Turbine Div., General Electric Co., Cincinnati 15, O. Home: 31 E. 26th St., Covington, Ky.

BLISS, JOHN T., (m) Rocket Res. & Devel., Tech. Analysis, HADTT Holloman, N. M. Home: P. O. Box 334, Alamogordo, N M.

BLOCH, BYRON, (s) 6531 N. Newgard, Chicago 26, Ill.

BLODGETT, CHARLES L., (m) Supervisor, Liquid Oxygen Facility, G.M.R.D., Pan Amer. World Airways, P.A.F.B. Cocoa, Fla. Home: R. Rt. #1, Box 57C, Eau Gallie, Fla.

BLOOM, RALPH, JR., (m) Proj. Supv., Becco Chem. Div., Food Machinery & Chem. Corp., Buffalo, N. Y. Home: 71 St. Amelia Dr., Tonawanda, N. Y.

BLOOM, WILLIAM E., (a) Leadman, Aerojet-General Corporation, Azusa, Calif. Home: 1722 E. Huntington Dr., Duarte, Calif.

BLOXSOM, DANIEL E., (m) Engineer, Aro, Inc., Tullahoma, Tenn. Home: Tullahoma, Tenn.

BOCHER, HERMAN W., (s) Temple University, Philadelphia, Pa. Home: 5924 N. 10th St., Philadelphia 41, Pa.

BOCKELMAN, JAMES F., Technical Assistant Team, United States Army, Hq. 2d, GMGp (ssm) Ft. Bliss, Tex.

BOCKOVEN, ARTHUR G., Jr. Technician, Radio, Riddle Airlines, Miami International Airport, Miami, Fla. Home: 61 N.W. 79th St., Miami 38, Fla.

BOCKSTAHLER, ALAN J., (a) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc. 6633 Canoga Ave., Canoga Park, Calif. Home: 15471 Moorpark, Apt. #5, Encino, Calif.

BODE, GEORGE F., (m) Test Supvr., Rocket Dept., Curtiss-Wright Corp., Caldwell, N. J. Home: 25 Park St., Montclair, N. J.

BODE, HENDRIK W., (m) Direc. Res. Physical Sciences, Research Dept., Bell Telephone Laboratories, Inc., Mountain Ave., Murray Hill, N. J. Home: 153 Beechwood Rd., Summit, N. J. z

BODEN, ROBERT H., (m) Propulsion Center, North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 4711 San Feliciano, Woodland Hills, Calif.

BODEWADT, UWE T., Dr. Habil., Development Div., Compagnie des Engins a Reaction pour Vol Accelere, S.A.E., Cairo, Almaza, Egypt. Home: Beirut Str., 92(3), Heliopolis/Cairo, Egypt, P. O. Box 34.

BODICKY, ANDREW L., (m) Development Engineer, McDonnell Aircraft, St. Louis, Mo. Home: 6611 Traska, St. Louis 9, Mo.

BOEHM, GERHARD W., (a) Gyro Division, United States Time Corp., 500 5th Ave., New York 36, N. Y. Home: 477 S. Prospect Ave., W. Englewood, N. J.

BOEHM, JOSEF, (m) Chief, Guidance Design Section, Guidance & Control Lab., Redstone Arsenal, Huntsville, Ala. Home 812 Hermitage St., Huntsville, Ala.

BOERICKE, FREDERIC S., (m) District Sales Mgr., Haynes Stellite Co., Division Union Carbide & Carbon Corp., 2770 Leonis Blvd., Los Angeles 58, Calif. Home: 302 Fairview Ave., So. Pasadena, Calif.

BOGGIO, MARSHALL R., (s) Test Assistant, Reaction Motors, Inc., Denville, N. J. Home: 12 Wellington Ave., West Orange, N. J.

BOHRER, LIONEL C., (s) Graduate Assistant, Mechanical Engng. Dept., Northwestern Technological Institute, Northwestern Univ., Evanston, Ill. Home: 3rd St. Extension, New Martinsville, W. Va.

BOLIN, RICHARD L., (a) Management and Business Services Division, Arthur D. Little, Inc., 30 Memorial Dr., Cambridge, Mass. Home: 66 Coolidge Ave., Needham 92, Mass.

BOLKOW, LUDWIG, (m) Diplomingenieur, Stuttgart Flughafen (Airport of Stuttgart) Germany. Home: Stuttgart-Degertoch, Meistersinger-Srasse 26, Germany.

BOLLAY, WILLIAM, (m) President, Tech. Director, Aerophysics Development Corporation, Subsidiary of Studebaker-Packard Corporation, P. O. Box 949, Santa Monica, Calif. Home: 17411 Posetano Rd., Pacific Palisades, Calif.

BOLLINGER, LOREN E., (m) Res. Associate, Aero, Engng. Dept., Ohio State University, Columbus, O. Home: 1975 Wickford Rd., Columbus 21, O.

BOLSTER, CALVIN M., (f) Co-ordinator of Development, The General Tire and Rubber Co., 1708 Englewood Ave., Akron 9, O. Home: 212 Clemmer Ave., Akron 13, O.

BOLTON, MARQUIS W., (m) Engineer, JPL, Electronics Division, Calif. Inst. of Tech., 4800 Oak Grove, Pasadena, Calif. Home: 1385 Rexford St., Pasadena 8, Calif.

BOMAN, WILLIAM T. Jr., (m) Development Engineer, Engineering, The Greenleaf Manufacturing Co., 7814 Maplewood Industrial Ct., St. Louis 17, Mo. Home: 621 Sessions Ct., Crestwood 22, Mo.

BOND, LABAN W., (m) Sales Manager, The Robbins Company, Brook & Mable Sts., Attleboro, Mass. Home: 368 S. Main St., Attleboro, Mass.

BOND, WILLIAM E. G., (m) Exper. Devel. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 20529 Hackney St., Canoga Park, Calif.

BONEWITS, RICHARD E., (s) Purdue Univ., W. Lafayette, Ind. Home: 115 University St., W. Lafayette, Ind.

BONIFACI, LEONARD P., (m) Res. Engr., Engng. Dept., Boeing Airplane Co., Seattle 14, Wash. Home: 5219—38 S.E., Mercer Island, Wash.

BONNER, LYMAN G., (m) Mgr., Explosives Research Division and High Pressure Laboratory, Hercules Powder Company, Hercules Experiment Station, Wilmington, Del. Home: 7 N. Woodward Ave., Wilmington, Del.

BONNEY, LYLE D., (m) Chief Engr., Small Missiles Range Radar Site, White Sands Signal Corps Agency, WSPG, New Mex. Home: 1105 Branson Ave., Las Cruces, New Mex.

BOODA, CDR, LARRY L., (m) Naval Air Facility, Oppama, Japan. Home: Navy No. 875, F.P.O., San Francisco, Calif.

BOQUIST, GLEN E., (m) Post Ordnance, Ft. Sheridan, Ill. Home: 251 North Ave., Highwood, Ill.

BORCHERDT, WALTER O., (m) Sr. Project Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 236 Morris Ave., Mt. Lakes, N. J.

BORDEN, JAY R., (m) Chief Engr., Automatic Controls Div., Clary Multiplier Corp., 408 Junipero St., San Gabriel, Cal. Home: 470 Calif. Terrace, Pasadena, Cal.

BORETZ, JONATHAN E., (m) Sr. Proj. Engr., Stratos Division, Fairchild Engine & Airplane Co., Orinoco Dr., Bayshore, N. Y. Home: 4 Firtree Lane, Huntington Station, N. Y.

BORLAND, WILLIAM C., (m) Coordinator of Engng., Port of New York Authority, 111 8th Ave., New York, N. Y. Home: 5 Yorke Rd., Mt. Lake, N. J

BORMAN, GARY L., (s) General Motors Fellow, University of Wisconsin, 1513 University Ave., Madison 5, Wisc. Home: 911 W. Dayton St., Madison 5, Wisc.

BORNSTEIN, LAWRENCE J., (m) Proj. Engr., Aerojet-General Corp., SRP Nimbus, Sacramento, Calif. Home: 1920 Rockbridge Rd., Sacramento 15, Calif.

BOROSON, N. HARVEY, (m) Assoc. Engr., Reaction Motors Inc., Ford Road, Denville, N. J. Home: 13 Alward Lane, Succasunna, N. J.

BOROVIAK, LEONARD C., (m) Missiles Service Rep., Missiles Service Dept., Douglas Aircraft Co., Inc., 715 Grand Ave., Waukegan, Ill. Home: 1643 N. Harvard Blvd., Hollywood 27, Calif.

BOSCO, GEORGE B. Jr., (m) Head, Rotating Machinery Dept., Liquid Engine Div., Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 7317 So. Gretna Ave., Whittier, Calif.

BOSSERT, K. J., (f) Asst. Chief Engineer, Convair, A Division of General Dynamics, San Diego, Calif.

BOTJE, JACOBUS M., (m) Proj. Engr., Jet Engine Dept. — Engng. Section, General Electric Co., Cincinnati 15, O. Home: 2042 Snowhill Drive #4, Cincinnati 37, O.

BOTTARI, ARNOLD, (s) Process Engineer, The Okonite Co., 730—21st Ave., Paterson, N. J. Home: 77 Ninth St., Wood Ridge, N. J.

BOTTARO, ANDREW, (m) Rocket Laboratory Sub-Section Leader, Bell Aircraft Corporation, Wheatfield, N. Y. Home: 341 Fifteenth St., Buffalo 13, N. Y.

BOTTORFF, JAMES A., (m) Res. Assist., Purdue Rocket Laboratory, Purdue University, Lafayette, Ind. Home: 243 Sheetz, W. Lafayette, Ind.

BOUEY, ERNEST A., (m) Engr., General Electric Co., 600 Main St., Johnson City, N. Y. Home: 5 Colorado Ave., Endwell, N. Y.

BOUIE, WILLIAM, (m) Engineering writer. Home: 547 West 157th St., New York 32, N. Y.

BOURNE, JOHN C., JR., (m) Engr., Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: P. O. Box 162, Fair Oaks, Calif.

BOUTELLE, RICHARD S., (m) President, Fairchild Engine and Airplane Corporation, P. O. Box 770, Hagerstown, Md. Home: Route #6, Hagerstown, Md.

BOVERIE, RICHARD T., (1st Lt. USAF) Guided Missile Launch Officer, Operations Br., 11th Tactical Missile Squadron, U.S. Air Force, Box 52, 11th Tactical Missile Squadron, Orlando AFB, Orlando, Fla. Home: 4139 Federer, St. Louis 16, Mo.

BOWERS, PAUL L., (s) Indiana Tech. College, 223 E. Washington Blvd., Ft. Wayne, Ind. Home: 2308 Smith St., Ft. Wayne, Ind.

BOWERS, WILLIAM M., (m) Research Engineer, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 7349 Remmet St., Canoga Park, Calif.

BOWERSOX, RALPH B., (m) Research Group Leader, JPL, Calif. Inst. of Tech., 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 4404 Chevy Chase Drive., LaCanada, Calif.

BOWIE, DONALD R., (s) Xavier University, Victory Parkway, Cincinnati 7, O. Home: 5836 Ridge Ave., Cincinnati 13, O.

BOWLIN, ROBERT C., (s) Res. Assist., Jet Propulsion Center, Purdue University, West Lafayette, Ind. Home: Bldg. 22, Apt. 1, Rossade Dr., W. Lafayette, Ind.

BOWMAN, KENNETH K., (m) Eng.-Atomic Power Study, Atomic Products Div., General Electric Co., 1 River Rd., Schenectady, N. Y. Home: 395 Saratoga Rd., Scotia 2, N. Y.

BOWMAN, RICHARD E, (m) Principal Chemist, Battelle Memorial Institute, 505 King Ave., Columbus, O. Home: 1770 Brentnell Ave., Columbus 19, O.

BOWMAN, RICHARD G., (m) Assistant Chief Engineer, Republic Aviation Corporation, Farmingdale, N. Y. Home: Remsen's Lane, RFD #1, Oyster Bay, N. Y.

BOXENHORN, BURTON, (m) Design Engr. "B", Controls Section, Aerojet-General, Azusa, Calif. Home: 816½ West Walnut Ave., Monrovia, Calif.

BOYD, EDGAR W., Service Engr., North American Aviation, 6349 E. Slawson, Los Angeles, Calif. Home: 18141 Rayen St., Northridge, Calif.

BOYER, LEE H., (m) Ballistic Evaluation & Data Reduction Supervisor, Rocket Fuels Div., Phillips Petroleum Co., McGregor, Tex. Home: 2316 Lake Air Drive., Waco, Tex.

BOYNTON, WILLIAM W., North American Aviation, Canoga Park, Cal. Home: 1018 Olive Lane, LaCanada, Calif.

BRABETS, ROBERT I., (m) Assoc. Chem. Engr., Chemistry & Chem. Engng. Dept., Armour Research Foundation, 10 W. 35th., Chicago 16, Ill. Home: 223 S. Stewart, Lombard, Ill.

BRADLEY, HAROLD H., JR., (m) Chem. Engr. USNOTS, China Lake, Calif. Home: 300A Tyler, China Lake, Calif.

BRADLEY, S. LEROY, (m) Engr., Inet-Palmer Div., Leach Corp., 4441 S. Santa Fe, Los Angeles 58, Calif. Home: 1201 Greenfield, Arcadia, Calif.

BRADLEY, THOMAS F., (m) Development Engineer, Rocky Mountain Arsenal, Denver, Colo. Home: 724 Fulton St., Aurora, Colo.

BRADSHAW, SAMUEL L., (m) Tech. Editor, Publications Dept., Aerojet-General Corp., 6352 N. Irwindale, Azusa, Calif. Home: 624 E. Bennett Ave., Glendora, Calif.

BRADSPIES, ROBERT W., (s) Private, Army Ballistic Missile Agency, Redstone Arsenal, Huntsville, Ala. Home: Det. A. 9377 TU Ord., ABMA, Redstone Arsenal, Huntsville, Ala.

BRADY, C. ALLAN, (m) Operating Mgr., Missile Operations, Chrysler Corporation, P. O. Box 2628, Detroit 31, Mich. Home: 32165 Westlady, Birmingham, Mich.

BRADY, FRANKLYN H., Engineer-in-charge, Analog Computer Facility, Missile Department, Farnsworth Electronics Co., Ft. Wayne, Ind.

BRADY, GEORGE W., (m) Director of Engineering, Curtiss-Wright Corporation, Propeller Div., Caldwell, N. J. Home: 41 Elston Rd., Upper Montclair, N. J.

BRAMANN, GEORGE M., (m) Contracts Administrator, Aviation Division, Olin Mathieson Chemical Corporation, P. O. Box 480, Niagara Falls, N. Y. Home: 1216 Norwood Ave., Niagara Falls, N. Y.

BRAMLET, JAMES B., Power Plant Devel. Engr., Guided Missile Development Div., Redstone Arsenal, Huntsville, Ala. Home: 1500 E. Clinton St., Huntsville, Ala.

BRANDENBERGER, ERNST MAX, Production Manager, Oerlikon Tool & Arms Corp. of America, P. O. Box 3049, Asheville, North Carolina. Home: P. O. Box 2372, Asheville, N. C.

BRANDES, DONALD J., (s) Res. Assist., Jet Propulsion Center, Purdue University, West Lafayette, Ind. Home: 205 Sylvia St., West Lafayette, Ind.

BRANDT, CHARLES A., (s) University of Minnesota, Minneapolis 14, Minn. Home: 724 Summit St., Eveleth, Minn.

BRANDT, HARRY, (s) Research Engineer, California Research Corporation, P. O. Box 446, La Habra, Calif. Home: 208½ W. Beverly Blvd., Whittier, Calif.

BRANDWEIN, DAVID S., (m) Chief Engr., Engng. Dept., NARTS, Lake Denmark, Dover, N. J. Home: 6 Edgemere Rd., Livingston, N. J.

BRANNON, PAUL J., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 2307 Utley Rd., Flint, Mich.

BRANT, WILLIAM W., (s) Purdue University, W. Lafayette, Ind. Home: 805 E. 3rd St., Fowler, Ind.

BRAUN, GERHARD W., (m) Aero. Engr., Tech. Analysis Division, Holloman AFB, N. M. Home: 2308 Pecan Dr., Alamogordo, N. M.

BRAUNSTEIN, ROBERT, (s) Univ. of Michigan. 17394 Wildmere, Detroit 21, Mich.

BRAY, RICHARD A., (a) Supervisor, Systems' Group, Electronics Production Engng. Section, Guided Missile Division, Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles, Cal. Home: 8814 Long Beach Blvd., South Gate, Cal.

BREDER, SAM C., (m) Director, Customer Service Metal Products, Ryan Aeronautical Company, 2701 West Harbor Dr., San Diego 12, Calif. Home: 1881 Viking Way, La Jolla, Calif.

BREESE, VANCE, (m) Director, Gyro Program, Electronics Division, Iron Fireman Manufacturing Company, 2838 S.E. Ninth Ave., Portland 2, Ore. Home: 258 S. Carmelina, Los Angeles 49, Calif.

BREIDENOUR, ROBERT C., (s) Liaison Engineer, Douglas Aircraft Company, 827 Lapham, El Segundo, Calif. Home: 6900 W. 84th Place, Los Angeles 45, Calif.

BREIDENSTEIN, RICHARD M., (m) Aerodynamacist, Bell Aircraft Corporation, P. O. Box 1, Buffalo 5, N. Y. Home: 180 McKinley Parkway, Buffalo 20, N. Y.

BREITWIESER, CHARLES J., (m) Vice Pres., General Mgr., LearCal Division, Lear, Incorporated, 3171 So. Bundy Dr., Santa Monica, Calif. Home: 12272 Sky Lane, Los Angeles 49, Calif.

BREMNER, ROBERT J., (a) Design Draughtsman, Project Office, Rocket Div., DeHavilland Engine Co. Ltd., Stag Lane, Edgware, Middlesex, England. Home: 26 Beaufort Gdns., Hendon Central, London, N.W. 4, England.

BRENKLE, JOSEPH, (m) Lt. USAF, Survey & Computation Officer, 69th Pilotless Bomber Sq., A.P.O. 109, c/o Postmaster, New York, N. Y.

BRENNAN, DANIEL C., (m) Washington Representative, Hycon Mfg. Company, Suite 815, 815 15th St., N.W., Washington 6, D. C. Home: 3721 49th St., N.W., Washington 16, D. C.

BRENNAN, WILLIAM J., (m) Chief, Design and Devel. Section, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 5440 Corbin, Tarzana, Calif.

BRENT, IRL D'ARCY, (m) Chief, Science Div., U.S. High Commissioner for Germany, OCA-HICOG, c/o American Consulate Gen'l, APO 757, c/o P.M., New York, N. " Home: Apt. 1, 22 J. Becher Sts., Frankfurt, A/m Germany.

BRERETON, THOMAS B., (s) Specialist Third Class, U.S.A. (Guided Missiles), "E" Batry, 2nd, Bn 1st Guided Missile Grp., Ft. Bliss, Tex. Home: 207 Kendrick Ave., Columbus, Ga.

BREWER, G. DANIEL, (m) Technical Staff, Guided Missile Research Division, Ramo-Wooldridge Corp., 5800 Arbor Vitae, Los Angeles 45, Calif. Home: 10578 Bradbury Rd., Los Angeles 64, Calif.

BRICE, PHILIP E. R., (m) Director of Engng., Guided Missiles Division, Republic Aviation Corp., 447 Broadway, Hicksville, N. Y. Home: 287 Ocean Ave., Amityville, L. I.

BRIDGE, JAMES A., (m) Elec. Engr., Electrical Design, Tumarkin, Morgan & Emerman, 140 Nassau St., New York 38, N. Y. Home: 75 Waldron Ave., Staten Island 1, N. Y.

BRIDGER, JAMES M., (m) Head, Vehicle Branch, Project Vanguard, Naval Research Laboratory, Washington 25, D. C. Home: RFD 1, Box 622, Clinton, Md.

BRIDGES, WILLARD A., (m) Military Coordinator, Missile Systems Div., Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 15907 Victory Blvd., Van Nuys, Calif.

BRIDGFORTH, ROBERT M., JR., Sr. Group Engr., Power Plant Staff, Boeing Airplane Company, Seattle, Wash. Home: 4325 87th Ave., S.E., Mercer Island, Wash.

BRIGGS, EDWARD F., (m) Manager, Aviation Industry Section, Johns Mansville Sales Corp., 22 E. 40th St., N.Y.C. Home: 106 Bay Dr., Massapequa, N. Y

BRIGLIO, ANTHONY, JR, (m) Engineering Specialist, Guided Missile Engineering Div., JPL, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, Calif. Home: 2102 Parnell Way, Altadena, Calif.

BRILL, JAY R., (m) Capt. USAF, Project Engineer, Nuclear Propulsion Branch, Wright Air Development Center, Wright-Patterson AFB, O. Home: 425 Chaucer Rd., Dayton, O.

BRILL, YVONNE C., (m) Curtiss-Wright Corp., Caldwell, N. J. Home: P. O. Box 134, Hasbrouck Hgts., N. J.

BRIMMER, ROBERT A., (m) Prop. Engr., Engng. Dept., Chance Vought Aircraft, Dallas Tex. Home: 1621 Dorothy Dr., Grand Prairie, Tex.

BRINCKA, DONALD R., (m) Power Plant Engr., Missile Division, Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 4140 Center St., Culver City, Calif.

BRINCKERHOFF, RICHARD C., (s) Indiana Technical College, 424 East Main St., Ft. Wayne, Ind. Home: RD #1, Middletown, N. Y.

BRITTAIN, CHARLES W., (a) Design Engineer, Aerojet-General Corporation, Azusa, Calif. Home: 10251 Santa Anita Ave., Ontario, Cal.

BROADSTON, JAMES A., (m) Mgr. Propulsion Field Laboratory, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Cal. Home: Star Route, Agoura, Calif.

BROADWELL, JAMES E., (m) Assoc. Prof., Dept. of Aero-Engng., Univ. of Michigan, Ann Arbor, Mich. Home: 707 Duncan, Ann Arbor, Mich.

BROBST, JOHN A., (s) Indiana Technical College, 416 E. Washington Blvd., Ft. Wayne, Ind. Home: 1929 Woodvale, Mt. Penn., Pa.

BROCK, HAROLD W., (m) Division Manager, A. O. Smith Corporation, P. O. Box 584, Milwaukee 1, Wisc. Home: 5684 N. Shore Dr., Milwaukee 11, Wisc.

BROCK, HORACE, (m) Exec. Vice Pres., New York Airways, La Guardia Field, Flushing, 71, N. Y. Home: Brookville Rd., Jericho, L. I., N. Y.

BROMAN, GUNNAR E., (m) Guided Missile Dept., Royal Air Board, Stockholm 80, Sweden. Home: Ornstigen 3, Naesby Park, Sweden.

BROMBERG, BEN G., Chief Engr., Missile Engng. Div., McDonnell Aircraft Corp., P. O. Box 516, St. Louis 3, Mo. Home: 811 Jackson St., St. Charles, Mo.

BROOKS, ARNOLD, (m) Gerard Swope Fellow at Princeton University, Princeton, N. J. Home: 225-A Marshall St., Princeton, N. J.

BROOKS, EVERETT S., (m) Guided Missile Project Engr., Redstone Arsenal, Huntsville, Ala. Home: 516 Locust St., Huntsville, Ala.

BROOKS, LEROY A., (m) Secretary and Treasurer, Excelco Developments, Inc., Mill St., Silver Creek, N. Y. Home: 138 Hubbell St., Buffalo, N. Y.

BROOKS, ROGER R., Parks College of St. Louis Univ., E. St. Louis, Ill. Home: 105 Kenwood Lane, Collinsville, Ill.

BROOKS, WILLIAM S., (m) Sr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: Apt. 10, 4366 Ventura Canyon Ave., Sherman Oaks, Calif.

BROSS, DAVID R., (m) Rocket Controls Devel. Engr., Liq. Eng. Rocket Control Dept., Aerojet-General Corporation, Azusa, Calif. Home: 821 E. Myrtle St., Glendora, Calif.

BROUGHTON, S. A., (m) Technical Staff, Hughes Aircraft Co., Radar Division, Culver City, Calif. Home: 106 Via Sevilla, Redondo Beach, Calif.

BROUSSEAU, JOSEPH A., JR., (m) Res. Engr., Power Plant Unit, Pilotless Aircraft Div., Boeing Airplane Co., 7755 Marginal Way, Seattle, Wash. Home: 1513 West 57 St., Seattle 7, Wash.

BROWER, JACK M., Design Engr. "A", Aerojet-General Corporation, P. O. Box 296, Azusa, Calif. Home: 834 S. Buena Vista Ave., Pomona, Calif.

BROWN, ALBERT B., Supvr., of Facilities, Aircraft Gas Turbine Devel. Dept., General Electric Co., Malta Test Station, Ballston Spa, N. Y. Home: 1102 Glenwood Blvd., Schenectady 8, N. Y.

BROWN, CECIL D., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8043 Hesperia Ave., Reseda, Calif.

BROWN, CLYDE O., (m) Senior Chemist, Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 5332 Glendora Ave., Covina, Calif.

BROWN, DAVID, (m) Asst. V.P.—Development, Scientific Design Co., 2 Park Ave., New York 16, N. Y. Home: 49 W. 12th St., New York 11, N Y.

BROWN, DAVID M., (m) Mgr., A.G.T.—Devel. Dept., General Electric Co., Cincinnati 15, O. Home: 7917 Tances Dr, Maderia, O.

BROWN, EARL T., (m) Engng. Lab. Tech., Engng. Dept., Bendix Aviation Corp., 5th St. & Ford Blvd., Hamilton, O. Home: 4878 Fairfield Ave., Fairfield, O.

BROWN, EDWARD M., (m) Sales Engr., Instrument & Systems Div., Norden-Ketay Corp., Wiley St., Milford, Conn. Home: 27 W. Woodbine Dr., Freeport, L. I., N. Y.

BROWN, FRANCIS M., (s) Parks College, East St Louis, Ill. Home: 108 S. 16th St., Denison, Iowa

BROWN, FRANK H., JR., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 20627 de Forest St., Woodland Hills, Calif.

BROWN, FRED I., JR., (m) Mgr., Rocket Eng. Sales, Aircraft Gas Turbine Development Dept., General Electric Co., Concinnati, O. Home: 6825 Miami Rd., Cincinnati, O.

BROWN, GRAHAM B., Works Mgr., Tube Reducing Corporation, 520 Main Ave., Wallington, N. J. Home: 89 Washington Place, Ridgewood, N. J.

BROWN, JACK W., (m) North American Aviation, Inc., Downey, Calif. Home: 5025 Medina Rd., Woodland Hills, Calif.

BROWN, JAMES E., (s) University of California, Berkeley, Calif. Home: 8840 Burr St., Oakland 5, Calif.

BROWN, JOHN A., (m) Meterologist, U. S. Weather Bureau, LaGuardia Field, N. Y. Home: 404 Riverside Dr., New York City.

BROWN, KEITH R., Engr., Installation & Service Engng., General Electric Company, P. O. Box 1858, Seattle 11, Wash. Home: 7081 West Mercer Way, Mercer Island, Wash.

BROWN, LAWRENCE S., (m) Staff Proj. Engr., Ford Instrument Co. Div. of Sperry Rand Corp., 31-10 Thomson Ave., Long Island City 1, N. Y. Home: 23 Highwater Ave., Massapequa, L. I., N. Y.

BROWN, RALPH E., (m) Chem. Engr., Genisco, Inc., 2233 Federal Ave., Los Angeles 64, Calif. Home: 8412 Loyola Blvd., Los Angeles 45, Calif.

BROWN, ROBERT C., (m) Patent Counsel, Patent Dept., Aerojet-General Corp., 6352 N. Irwindale Ave., Azusa, Calif. Home: 148 No. Morada, West Covina, Calif.

BROWN, RUSSELL E., (m) Sr. Rep., Customer Service Department, McDonnell Aircraft Corporation, P. O. Box 516, St. Louis 3, Mo. Home: 1598 Fitzgerald Blvd., Edwards, Calif.

BROWN, VERNEY L., (s) Indiana Technical College, 225 E. Washington, Ft. Wayne, Ind. Home: 3212 Edna St., Ft. Wayne, Tex.

BROWN, WILBERT R., (m) Reaction Motors, Inc., Denville, N. J. Home: 5 Crescent Dr., Mountain Lakes, N. J.

BROWN, WILLIAM H., Laboratory Tester, Refinery, The Texas Co., Eagle Point Works, Westville, N. J. Home: 108 E. Madison Ave., Collingswood 7, N. J.

BROWNING, DALE P., (m) Quality Control Representative, Bell Aircraft Corporation, Inspection Div., Box 391, Holloman AFB, New Mex. Home: Box 846, Holloman AFB, New Mex.

BROWNING, JAMES A., (m) Assistant Professor of Mechanical Engineering, Dartmouth College, Hanover, N. H. Home: Norwich, Vt.

BROWNING, ROWLAND E., (m) Chief, Airframes Sec., Aircraft Engineering Branch, Air Material Comm'd, Norton AFB, San Bernardino, Calif. Home: 1424 W. Crescent, Redlands, Calif.

BRUCK, H. W. (s) Research Assistant, Princeton University, Organizational Behavior Section, Princeton, N. J. Home: 400-C Butler Ave., Princeton, N. J.

BRUNNER, BUDDY L., (s) School of Science, Purdue University, West Lafayette, Ind. Home 332½ South Chauncey, W. Lafayette, Ind.

BRUNNER, WILLIAM L., (m) University of Washington, Seattle, Wash. Home: 318 W. Galer, Seattle 99, Wash.

BRUNS, AUGUST F., (a) Regional Rep., Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 5413 N. Banewell Ave., Azusa, Calif.

BRUSCHI, ARTHUR T., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 7050 Lubao Ave., Canoga Park, Calif.

BRYANT, AUSTIN U., (m) Chief Engr., Grove Valve & Regulator Co., 6529 Hollis St., Oakland 8, Calif. Home: 2349 San Juan Ave., Walnut Creek, Calif.

BRYANT, ROBERT L., (s) Purdue University, West Lafayette, Ind. Home: Apt. 6, Bldg. 22, Ross Ade Dr., W. Lafayette, Ind.

BUCCELLA, FRANKLIN J., (s) Engr.-Res. Rocketdyne, A Division of North American Aviation, Inc., Canoga Ave., Canoga Park, Calif. Home: 13207 Oxnard St., Van Nuys, Calif.

BUCHAN, ALEXANDER, (m) Vice Pres., Air Trails Network, 121 N. Main St., Dayton 2, O. Home: 5518 Mad River Rd., Dayton 2, O.

BUCHANAN, JACK, Chief Test Engr., Redstone Division, Thiokol Chemical Corp., Huntsville, Ala. Home: 300 Westmoreland Dr., Huntsville, Ala.

BUCHHOLD, THEODORE, (m) Consulting Engineer, General Engineering Laboratory, General Electric Co., River Road Bldg. 37, Schenectady, N. Y. Home: 826 Karenwald Lane, Schenectady, N. Y.

BUCKEL, WILLIAM L., (m) Teletype Maintenance, U. S. Air Force, 7350 A.B. Sqd. APO 742, N. Y., N. Y. Home: 3950 S. Grant, Englewood, Colo.

BUCKLEY, PAULITA A., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 1117 Brooklyn, Ann Arbor, Mich.

BUCKSTAFF, JOHN D., JR., (m) Propulsion Engr., Engng., Chance Vought Aircraft Inc., P. O. Box 5907, Dallas, Tex. Home: 1101 Kensington Dr., Dallas 8, Tex.

BUCKWALTER, JOHN C., (m) Chief Engineer, Douglas Aircraft Company, Inc., Long Beach Division, Long Beach 1, Calif. Home: 9625 LaAlba, Whittier, Calif.

BUDISH, NATHAN N., (m) Preliminary Design Engineer, Boeing Airplane Co., Seattle, Wash. Home: 16023—14 S.W., Seattle 66, Wash.

BUELL, DAVID N., (m) Asst. Dept. Head, Structural Design, Missile Operations Division, Chrysler Corporation, P O. Box 2628, Detroit 31, Mich. Home: 2616 Woodland, Royal Oak, Mich.

BUFFINGTON, JOHN W., (a) Res. Engr., Mechanical Div., General Mills, Inc., 2003 E. Hennepin Ave., Mpls., Minn. Home: 5541 Vincent Ave., So. Mpls., Minn.

BUJAC, JAMES N., JR., (m) Mech. Design Engr., Naval Ordnance Dept.—Antenna Eng. Section, General Electric Co., 100 Plastics Ave., Pittsfield, Mass. Home: 8 Pomeroy, Pittsfield, Mass.

BULLARD, CHARLES PHIL, (s) Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 21328 Providencia, Woodland Hills, Calif.

BULLION, LEROY D., (m) Patent Examiner, Div. 54, U. S. Patent Office, Dept. of Commerce, Washington, D. C. Home: 6132 32nd Pl., NW., Washington 15, D. C.

BULLITT, DOROTHY S., (m) President, King Broadcasting Company, 320 Aurora Ave., Seattle 9, Wash. Home: 1014 East Galer, Seattle 2, Wash.

BULLOCK, J. B., (s) University of Michigan, Ann Arbor, Mich. Home: 1123 Parkwood, Flint, Mich.

BUNKER, LEONARD R., (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 15 Ballard Ave., Valley Stream, N. Y.

BUNYAK, RONALD S., (s) Purdue University, Hall "X", Box 49, W. Lafayette, Ind. Home: 1314 Roemer Blvd., Farrell, Pa.

BURDEN, WILLIAM A. M., (m) Partner, William A. M. Burden & Co., 630 Fifth Ave., New York 20, N. Y. Home: 820 Fifth Ave., New York 21, N. Y.

BURDETT, HARRY W., JR., (m) Chief Engineer, Special Products Div., Reaction Motors, Inc., Denville, N. J. Home: 379 Butternut Ave., Wyckoff, N. J.

BURDICK, W. E., (a) Works Manager, Aerojet-General Corporation, Sacramento, Calif. Home: 5102 Palm Drive, La Canada, Calif.

BURGER, GEORGE S., (a) Abrasive Technician, Linde Air Products Corp., E. Park Dr. & Woodward Ave., Tonawanda, N. Y. Home: 18 Loxley Rd., Buffalo 25, N. Y.

BURGESON, JOHN W., (a) Physicist, U. S. Navy Mine Defense Lab., Panama City, Fla. Home: Box 56, Panama City Beach, Fla.

BURGGRAF, ODUS R., (m) Assis't Professor, Inst. of Technology, USAF, MCLI, Wright-Patterson AFB, O. Home: Apt. C, 3449 Richfield Dr., Dayton 10, O.

BURKE, ROBERT W., (m) Engr., Futurecraft Corp., 1717 N. Chico, El Monte, Calif. Home: 1000 Crestview Dr., Pasadena, Calif.

BURKETT, THOMAS W., (m) Administrative Supervisor, Production Department, Thiokol Chemical Corp., Longhorn Division, Marshall, Tex. Home: 2906 Bel-Air Dr., Marshall Tex.

BURKHART, ERNIE C., (m) President, Genisco Inc., 2233 Federal Ave., Los Angeles 64, Calif. Home: 462 Abramar Ave., Pacific Palisades, Cal.

BURKS, SAM J., JR., (a) Foreign Service Officer, U. S. Info. Agency, Washington 25, D. C. Home: Apt. 202, 1316 Patrick Henry Dr., Falls Church, Va.

BURLAGE, HENRY, JR., (m) Director, Propulsion Laboratory, Case Institute of Technology, Cleveland 6, O. Home: 2529 Bolton Rd., Cleveland Hts. 18, O.

BURLEIGH, DEAN E., (m) Manager—Engineering Administration, Engineering Department, Beech Aircraft Corporation, 9709 East Central Ave., Wichita 1, Kan. Home: 220 North Edgemoor, Wichita, Kan.

BURLEY, JAMES, (s) Draftsman, Convair, Division of General Dynamics Corp., Ft. Worth, Tex. Home: 3020 Astor St., Ft. Worth, Tex.

BURNELL, EDWIN J., Head, Engr. Services Section, Ground Equipment Dept., Hughes Aircraft Co., International Airport Station, Los Angeles 45, Calif. Home: 705 Via Horcada, Palos Verdes Estates, Calif.

BURNER, LINCOLN C., (m) Electronics Engng. Assist., Glenn L. Martin Co., Middle River, Maryland, Md. Home: 2015 Northbourne Rd., Baltimore 14, Md.

BURNS, FRANCIS S., (m) Flight Test Engineer, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 16735 Saticoy, Van Nuys, Calif.

BURRIDGE, JAMES L., (m) Structures Supervisor, Glenn L. Martin Co., Middle River, Md. Home: 2516 Taylor Ave., Baltimore 14, Md.

BURTON, EDWARD B., (m) Supervisor, Armament Design, Engng., Radioplane Co., 8000 Woodley, Van Nuys, Calif. Home: 17600 Osborne, Northridge, Calif.

BURTON, EDWARD F., (m) Chief Engineer, Douglas Aircraft Company, Inc., Engineering Division, 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 366 So. Westgate Ave., Los Angeles 49, Calif.

BURWELL, JAMES J., (s) Ultra Sonic Tech., Douglas Aircraft Co., 827 Lapham, El Segundo, Calif. Home: 462 Palos Verdes Blvd., Redondo Beach, Calif.

BUSH, DALLACE K., (m) Research and Development Engineer, Boeing Airplane Co., Seattle, Wash. Home: 16911—21st S.W., Seattle 66, Wash.

BUSH, POWELL D., JR., Research Engr. Aircraft, Engng., Test Laboratory, Lockheed Aircraft Corp., Ga. Division, Marietta, Ga. Home: RFD #6, Marietta, Ga.

BUSH, WILLIAM R., (m) Assist. Gen. Sales Mgr., Hoffman Laboratories, Inc., 3761 S. Hill St., Los Angeles 7, Calif. Home: 350 S. Fuller Ave., Los Angeles 36, Calif.

BUSKIRK, DAVID E., (m) Lt. USAF, Project Engineer, Exp. Rocket Engine Test Station, Edwards, A.F.B., Edwards, Calif. Home: 1098 Community Rd. Edwards, Calif.

BUTKEWICZ, PETER J., (s) Parks College, East St. Louis, Ill. Home: 106 Gilroy St., Dunmere 12, Penn.

BUTLER, CLIFTON L., (m) Lt. Col., U. S. Air Force, Hq. Holloman Air Dev. Cen., Holloman AFB, N. M. Home: P. O. Box 681, Holloman AFB., N. M.

BUTLER, EARL M., (m) Deputy Systems Mgr., Industrial Engng. Branch, Army Ordnance — Redstone Arsenal, Huntsville, Ala. Home: 109 Panorama Dr., Huntsville, Ala.

BUTLER, GEORGE D., (m) Dir. of Sales, Norden-Ketay Corp., 99 Park Ave., New York 16, N. Y. Home: Crest Lane, Scotch Plains, N. J.

BUTLER, GEORGE V., (m) Staff Assist., Missile Design, Douglas Aircraft Co., 3300 Ocean Park Blvd., Santa Monica, Calif. Home: 4955 Topeka Dr., Tarzana, Calif.

BUTTER, CHAS. D., (s) Univ. of Minnesota. Home: 3809—23d Ave., South, Minneapolis, Minn.

BUTTERBAUGH, GALEN P., (m) Proj. Engr., Lynwood Engng. Dept., Western Gear Corporation, 2600 E. Imperial Hwy., Lynwood, Calif. Home: 11757 State St., Lynwood, Calif.

BUTTERFIELD, JOHN P., (m) Chief Engr., Missile Operations, Chrysler Corporation, P. O. Box 2628, Detroit 31, Mich. Home: 1145 Balfour, Grosse Pointe 30, Mich.

BUXO, VINCENT M., (s) Academy of Aeronautics, LaGuardia, Airport, N. Y. Home: 201 Monroe St., Massapequa Pk., N. Y.

BUXTON, JOHN A., (s) Academy of Aeronautics, LaGuardia Airport, Flushing, N. Y. Home: North Granville, N. Y.

BYERS, RICHARD, (m) Res. Engr., Lockheed Aircraft Corp., MSD, 7701 Woodley, Van Nuys, Calif. Home: 10951 Ruffner Ave., Granada Hills, Calif.

BYINGTON, HARRY W., (m) Rocket Research Engr., Rocket Dept., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 36 Burnside Dr., Tonawanda, N. Y.

BYRD, LEWIS H., (m) Physicist, Evaluation Branch, White Sands Signal Corps., White Sands Proving Ground, N. M. Home: 1511 Boutz Rd., Las Cruces, N. M.

BYRON, ROBERT A., (m) Engineer Research, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: Apt. 5, 4908 Sepulveda Blvd., Sherman Oaks, Calif.

BYRON, THOMAS J., USAF Asst. Gen. Supvr., Electronic Manufacturing Div., Hughes Aircraft Co., Florence & Teale, Culver City, Cal. Home: 2360 Portland St., Los Angeles 7, Cal.

C

CABELL, JOSEPH, B., JR., (s) Tulane University, New Orleans, La. Home: 591 Warrior Trail, Jackson, Miss.

CADWELL, GAIUS, (m) Sr. Proj. Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: Openaki Rd., RD #1, Dover, N. J.

CAIDIN, MARTIN, Home: 97-37 63rd Rd., Rego Park 74, N. Y.

CALAMORE, DONALD V., (m) Research Engineer, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 1365 Kelton Ave., Los Angeles 25, Calif.

CALCOTE, HARTWELL F., (m) Vice President, Research Division, Experiment Incorporated, Deep Water Terminal Rd., Richmond 2, Va. Home: 201 Longview Drive, Richmond, Va.

CALDWELL, DONALD C., (m) Associate Engineer, Aerodynamics—Propulsion Div., Glenn L. Martin Co., Balto. 20, Md. Home: 1802 Ingram Rd., Balto. 14, Md.

CALDWELL, FRANK W, (m) Consulting Engineer, 54 Pilgrim Rd., West Hartford, Conn.

CALHOUN, JOHN D., (m) Asst. Prof. Mech. Engr., USAF, Inst. of Technology, Dayton, O. Home: 816 Adams St., Fairborn, O.

CALHOUN, JOHN T., (m) Design Engr., Beech Aircraft Corp., Wichita 1, Kan. Home: 944 N. Old Manor Rd., Wichita, Kan.

CALHOUN, PHILIP C., (m) Lt. Col., USAF, APO #13, c/o PM, N. Y., N.Y. Home: 2668 Via Pachelo, Palos Verdes Estates, Calif.

CALHOUN, WILLIAM D., (m) Sales Engineer, Haynes Stellite Co., 2770 Leonis Blvd., Los Angeles 58, Calif. Home: 3118 Encinal Ave., LaCrescenta, Calif.

CALKINS, THOMAS C., (s) Airman/Third Class, USAF, 3430 Sturon, P. O. Box 3000, Lowry A.F.B., Denver, Colo. Home: 1023 Chicago Ave., Oak Park, Ill.

CALLERAME, JOSEPH, (s) Home: 180 Central Pk., Rochester 5, N. Y.

CALTABIANO, SALVATORE, (a) Senior Propulsion Engineer, Propulsion Section, Chance Vought Aircraft Inc., Dallas, Tex. Home: 834 Ryan Rd., Dallas, Tex.

CALVIN, JOHN N., (a) Home: 3666 Stoer Rd., Shaker Heights 22, O.

CAMBEL, ALI BULENT, (m) Assoc. Prof. Engng., Northwestern University, Evanston, Iill. Home: 1810 Hinman Ave., Evanston, Ill.

CAMERON, DONALD A., (s) Mass. Institue of Technology, Cambridge, Mass. Home: 44 Anawan Ave., West Roxbury 32, Mass.

CAMERON, ERWIN E., (m) Physicist, Field Measurements Branch, Flight Determination Laboratory, WSPG, N. M. Home: 1821 E. Missouri, Las Cruces, N. M.

CAMERON, JOHN L., (a) Chemist, USAF, Holloman Air Force Base, N. M. Home: Box 1213, Alamogordo, N. M.

CAMPBELL, ALBERT S., (m) Chief, Precision Measurements Lab., E.M.L. Standards & Calibration Br., WSPG, Las Cruces, N. M. Home: 1713 Princess Jeanne Dr., Las Cruces, N. M.

CAMPBELL, ERNEST D., (m) Rocket Res. Chem., Rocket Res. Branch, U. S. Naval Ordnance Test Station, China Lake, Calif. Home: 526-M Nimitz Rd., China Lake, Calif.

CAMPBELL, FRANCIS W., (m) Asst. for Guided Missiles, Armament Div., AFMME, Hq. USAF, The Pentagon, Washington, D. C. Home: 504 Paulonia Rd., Alexandria, Va.

CAMPBELL, PAUL B., Facility Coordinator, Airborne Guidance, Boeing Airplane Co., Box 97, Melbourne, Fla. Home: 146 Ninth Ave., Indialantic, Fla.

CAMPBELL, WILLIAM E., (m) Acting Mgr., Solid Engine & Chem. Div., Aerojet-General Corp., Irwindale Ave., Azusa, Calif. Home: 1909 Galbreth Rd., Pasadena 7, Calif.

CANADY, WARD M., (a) Chrm, Finance Committee, Willys Overland Motors, Toledo, O.

CANCILLA, MYRON A., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 38922 Rambler, Palmdale, Calif.

CANNEY, HEYWARD E., JR., (m) President, General Astronautics Corporation, West Shore Rd., Oyster Bay, New York, Home: Bayville Rd. Locust Valley, New York.

CANNON, JOHN N., (a) Engr., Aerophysics Dept., North American Aviation Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 15116 Mystic St., Whittier, Calif.

CANRIGHT, RICHARD B., (m) Missile Plant Engr., Douglas Aircraft Company, 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 2561 S. Bundy Drive, Los Angeles 64, Calif.

CAOUETTE, ZEPHIRIN, (a) Jr. Designer, Engng., Pratt & Whitney Aircraft, 400 Main St., East Hartford, Conn. Home: 2 Oakwood St., E. Hartford, Conn.

CAPASSO, VINCENT N., (m) 1/Lt., Performance Engr., USAF, Box 0-243, Edwards AFB, Calif. Home: 408 E. Kettering, Lancaster, Calif.

CARAIVAN, JORDAN, (a) Philadelphia Metal Stamping Co. of Penn. 400-412 E. Rittenhouse St., Phila. 44, Pa. Home: 5337 Greene St., Phila. 44, Pa.

CARAS, BERNARD, (a) Engr., Sylvania Electric Products, Inc., 83-30 Kew Gardens Rd., Kew Gardens, N. Y. Home: 65 Lincoln Blvd., Long Beach, N. Y.

CARAWAY, W. HODGE, (m) Petroleum Engr., US Bureau of Mines, 1415 Appraisers Bldg., 630 Sansome St., San Francisco, Calif. Home: 2020 Green St., Apt. 8, San Francisco, Calif.

CARBINE, IVAN L., (m) Assoc. Elec. Engr., Physical Science Laboratory, New Mexico College of A. & M., Box 548, State College, N. M. Home: Box 8, Star Route, Las Cruces, N. M.

CARDULLO, MARIO WM., (s) Polytechnic Inst. of B'klyn, 99 Livingston St., B'klyn 1, N. Y. Home: 651 DeGraw St., Bklyn 17, N. Y.

CARHART, RICHARD, (m) Dept. Engr., Missile Systems Div., Lockheed Aircraft, 7701 Woodley Ave., Van Nuys, Calif. Home: 16775 Livorno Dr., Pacific Palisades, Calif.

CARIUS, GEORGE E., (m) Design-Engr., Aerojet-General Corp., 410 N. Citrus St., Covina, Calif. Home: 6043 Cahuenga Blvd., N. Hollywood, Calif.

CARKEEK, RICHARD W., (m) Res. Engr., Power Plant Dept., Boeing Airplane Co., Seattle, Wash. Home: 10042 NE, 13th St., Bellevue, Wash.

CARL, DONALD H., (a) Farm Machine Operator, Mechanic and Salesman. Home: Boston, N. Y.

CARLSON, WALTER H., (s) Purdue University, W. Lafayette, Ind. Home: 282 Littleton St., W. Lafayette, Ind.

CARLTON, CLARENCE H., Assoc. Chem. Engr., Southwest Research Institute, 8500 Culebra Rd., San Antonio, Tex. Home: 135 Windsor Dr., San Antonio, Tex.

CARNESS, MARVIN MICHAEL, (m) Design-Engr., Aerojet-General Corp., LRP, Box 1947, Sacramento, Calif. Home: 2395 Tyrolean Way, Sacramento 21, Calif.

CARPENTER, DALE, (m) Res. Engineer, North American Aviation, Inc., Downey, Calif. Home: 22633 Sylvan St., Woodland Hills, Calif.

CARPENTER, PAUL, (m) Rocket Design & Service Instructor, Rocket Dept., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: Rt. #1, Saunders-Settlement Rd., Sandborn, N. Y.

CARPER, RICHARD D., (s) USA, A Btry, 3rd GM, Bn, Fort Bliss, Tex. Home: 218 NW, 6th Ave., Galva., Ill.

CARR, LEW J., (a) Sales Engr., Cook Electric Co., 2700 N. Southport, Chicago, Ill. Home: 7406 Caillet, Dallas, Tex.

CARROLL, JOHN J., (m) Design Engr., Study and Applied Research Dept., Liquid Engine Division, Aerojet General Corp., Irwindale Ave., Azusa, Calif. Home: 19034 Hollyvale, Glendora, Calif.

CARSON, WILLIAM T., JR., (m) Carson & Son, P. O. Box 407, Hughson, Calif.

CARTABIANO, A., (m) Chief of Flt. Test, Test Dept., Weapon Sys. Div., Radioplane Co., 8000 Woodley, Van Nuys, Calif. Home: 23138 Mariano, Woodland Hills, Calif.

CARTER, EDWARD H., (m) Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8201 Aura Ave., Reseda, Calif.

CARTER, JAMES M., (m) President, Carter Laboratories Inc., 2265 E. Foothill Blvd., Pasadena, Calif. Home: 797 So. Oak Knoll Ave., Pasadena, Calif.

CARTER, VONDELL, (s) Parks College, E. St. Louis, Ill.

CARTOTTO, EDWARD, (m) Group Leader, Instrumentation & Equipment, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 1531 Idlewood Rd., Glendale 2, Calif.

CARVEY, TOM B., (m) Asst. Head, Propulsion Department, Guided Missile Laboratories, Hughes Aircraft Co., Culver City, Calif. Home: 4417 Via Pinzon, Palos Verdes Estates, Calif.

CARY, REUBEN E., (s) Syracuse University, Syracuse, N. Y. Home: 801 First North St., Syracuse 8, N. Y.

CASANOV, L. C., (m) Pres., Miller Products, Inc., P. O. 325, No. Chicago, Ill. Home: Hotel Waukegan, Waukegan, Ill.

CASCIO, SALVATORE J., JR., (a) Credit Mgr., Rapid Finance & Loan #2, 2143 Harford Rd., Baltimore 18, Md. Home: 102 Westowne Rd., Baltimore, Md.

CASH, HARRY SYDNEY, (s) University School, Columbus, O. Home: 3420 Polley Rd., Columbus 21, O.

CASIRAGHI, GIOVANNI P., (m) Ch. Engr., Aircraft Div., Piaggio & Co., Via Antonio Cecchi 6, Genova, Italy. Home: Via Mylius 6-1, Genova, Italy.

CASLER, WILLIAM A., (m) Res. Coordinator, Stanford Research Institute, Menlo Park, Calif. Home: 625 Hale St., Palo Alto, Calif.

CASSIDY, THOMAS F., (s) Stevens Institute of Technology, Hoboken, N. J. Home: 11 Wynnewood Rd., Livingston, N. J.

CASTENHOLZ, PAUL D., Assist. Group Leader, Combustion Devices, Design & Development Section, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8608 Comanche Ave., Canoga Park, Calif.

CAULKINS, DAVID R., (s) Vickers Corp., Detroit, Mich. Home: 541 Seyburn Ave., Detroit 14, Mich.

CAVANAGH, JOSEPH F., (s) Indiana Technical College, 221 E. Washington, Ft. Wayne, Ind. Home: 1329 E. Wayne, Ft. Wayne, Ind.

CAVENDER, WILLIAM D., JR., (m) Des. Engr., Thrust Chamber Dept., Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 6300 Mariposa Ave., Citrus Heights, Calif.

CECKA, WILLIAM J., JR., (m) Chief, Engng. Test Section, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8929 Rathburn, Northridge, Calif.

CENSAK, ROBERT J., Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: 415 E. Washington Blvd., Ft. Wayne, Ind.

CHAMBERLAIN, CHESTER A., Secretary and Assistant to the President, E. W. Bliss Company, 1375 Raff Rd., S.W., Canton 10, O. Home: 4134 Valley Dr., N.W., Canton, O.

CHAMBERLIN, JOSEPH "Jac" A., (a) Designer, Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 1648 Greenfield Ave., Los Angeles 64, Calif.

CHAMPINE, ROBERT A., (m) Aero. Res. Pilot, Flight Research Dept., NACA, Langley Field, Va. Home: 35 Langhorne Circle, Warwick, Va.

CHAMPION, JACK A., (m) Private, 78th Ord. Det. USA, 78th Ord. Det. Redstone Arsenal, Huntsville, Ala. Home: 5 Ringbit Rd., Rolling Hills, Calif.

CHANDLER, EDWARD F., (m) Consulting Engr., 148 Richmond St., Brooklyn 8, N. Y.

CHANG, CHIEH CHIEN, (m) Prof. of Fluid Mechanics, Dept. of Aeronautical Engineering, University of Minnesota, Minneapolis 14, Minn. Home: 4536 Dupont Ave., So. Minneapolis 9, Minn.

CHAPLIN, LEO J., (s) New York University, University Heights, Bronx 53, N. Y. Home: 28 Carnegie Ave., Huntington, L. I., N. Y.

CHAPLINE, GEORGE F., (m) Vice Pres. & Gen. Mgr., Fairchild Engine Division, Fairchild Engine & Airplane Corp., Deer Park, L. I., N. Y. Home: 9 The Pines, Old Westbury, L. I., N. Y.

CHAPMAN, ROBERT B. III, (m) Vice Pres. & Asst. Gen. Mgr., Aircraft Armaments Inc., Cockeysville, Md. Home: 404 Towson Ave., Lutherville, Md.

CHARNOFF, LORRAINE, (s) Teaching Fellow, Dept. of Chemistry, Washington Square College, New York University, Washington Square, New York 3, N. Y. Home: 2234 Ocean Ave., Brooklyn 29, N. Y.

CHARYK, JOSEPH V., V. P. & Director, Aerophysics & Propulsion Division, Systems Research Corp., 13729 Victory Blvd., Van Nuys, Calif. Home: 22385 MacFarlane Dr., Woodland Hills, Calif.

CHASE, JOHN W., (m) Jr. Field Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8353 Fullbright Ave., Canoga Park, Calif.

CHENEY, SAMUEL H., JR., (m) Eng. AGT Div., General Electric Co., Evendale, O. Home: 42 Lilliedale Lane, Hamilton, O.

CHENG, SIN-I, Asst. Prof., Princeton University, Princeton, N. J. Home: 120 Prospect Ave., Princeton, N. J.

CHENOWETH, HALSEY B., (s) Los Angeles State College, 855 No. Vermont, L. A. 29, Calif. Home: 4205¼ Lockwood Ave., Los Angeles 29, Calif.

CHERNOWITZ, GEORGE, (m) Director, American Power Jet Co. Home: 705 Grand Ave., Ridgefield, N. J.

CHESTER, E. DUANE, (m) Des. Engr., Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 7446 Barbera Way, Rancho Cordova, Calif.

CHESUS, Frank O., Senior Engineer, Homing — Missile, Convair, A Division of General Dynamics Corp., Pomona, Calif. Home: Box 926, 1064 Kevin, Redlands, Calif.

CHIEI, LEON, (s) Pratt Institute, Brooklyn, N. Y. Home: 31-14 77th St., Jackson Heights 70, N. Y.

CHIERI, DR. PERICLE A., (m) Head, Mech. Engng. Dept., Southwestern Louisiana Institute, S.L.I. Station, Box 274, Lafayette, La. Home: 115 Smith St., Apt. 6, Lafayette, La.

CHILCOAT, MURRAY M., (m) Design Engr., Futurecraft Corp., 1717 N. Chico Ave., El Monte, Calif. Home: 1634 Kempton Ave., Monterey Park, Calif.

CHILDERS, MILFORD G., (m) Structural Requirements Dept. Engr., Structures Division, Lockheed Aircraft Corp., Burbank, Calif. Home: 1015 E. Grinnell Dr., Burbank, Calif.

CHILDS, HERBERT C., Product Manager, Film Div., Olin Mathieson Chemical Corp., 655 Madison Ave., New York 21, N. Y. Home: 159 Reef Rd., Fairfield, Conn.

CHILLSON, CHARLES W., (m) Chief Research Engineer, Propeller Division, Curtiss Wright Corp., Box 351, Caldwell, N. J.

CHISHOLM, CHARLES G., (m) Mgr., Sales Development, Haynes Stellite Co., Kokomo, Ind. Home: 404 Elliott Court, Kokomo, Ind.

CHMEL, J. K., (m) Pres. and Managing Director, Prenco Progress and Engineering Corp., Ltd., 7274 Stafford St., Toronto, Ont., Canada. Home: 1 Grenadier Gardens, Toronto, Ont., Canada.

CHORLEY, PERCY E., (m) Gen. Sales Mgr., Avica Equipment, Ltd. 1 Adams Place, Georges Rd., London, N. 7, England. Home: 73 Pampisford Road, Purley 2 Surrey, England.

CHRISTALDI, P. S., (m) Allen B. Dumont Labs., Inc., 11800 Olympic Blvd., Los Angeles, Calif.

CHRISTENSEN, HANS C., (m) Norwegian Defense Res. Estb., Forsvarets Forskningsinstiutt, Lillestrom, Norway. Home: Gjerdrumsgt 53, Lillestrom, Norway.

CHRISTENSEN, NIELS G., (m) Systems Analyst, Guided Missile Division, Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 3111 Flower St., Lynwood 2, Calif.

CHRISTENSEN, RAY G., (m) Staff Engr., Boeing Airplane Co., Box 3107, Seattle, Wash. Home: 8461 N.E. 4th, Bellevue, Wash.

CHRISTMAN, CLYDE C., JR., (s) Renssalear Polytechnic Inst., Troy, New York. Home: 18 Union St., Cobleskill, N. Y.

CHRISTOFFEL, JACK, (m) Instrumentation Engr., Instrumentation Dept., Aerojet-General Corp., Box 296, Azusa, Calif. Home: 208 Encinitas Ave., Monrovia, Calif.

CIRINEO, FRED V., JR., (s) Purdue University, 237 S. Grant St., W. Lafayette, Ind. Home: Toril, Davao City, Phillippines

CLABBY, JOHN T., (m) Sr. Engr., Guided Missile Div., Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 605 E. McKinley Ave., Pomona, Calif.

CLACK, SETH, (m) Bell Aircraft Corp., Buffalo, N. Y. Home: 30 Kimberly Dr., Williamsville 21, N. Y.

CLAPP, JOHN T., (m) Sr. Engr., Solid Eng., Dept., Aerojet-General Corp., Azusa, Calif. Home: 19034 Orangepath, Glendora, Calif.

CLARA, ERNEST A., (m) Engr. Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 15237½ Dickens St., Sherman Oaks, Calif.

CLARDY, WILLIAM W., (a) Cartographer, Geodetic Reference and Chart Control Unit, U. S. Navy Hydrographic Office, Washington 25, D. C. (Suitland, Md.) Home: 1024 South Wayne St., Arlington 4, Va.

CLARE, EDWARD T., (m) Chief Electronics Engr., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 6261 Dorothy Dr., San Diego, Calif.

CLARK, CHARLES C., (m) Mgr. Univ. Research, Olin-Mathieson Chemical Corp., 2400 Buffalo Ave., Niagara Falls, N. Y. Home: 10 Light St., Baltimore 3, Md.

CLARK, GERALD I., (m) Engr., Western Gear Works, 2600 E. Imperial H'way, Box 192, Lynwood, Calif. Home: 2108 Rose Dr., Whittier, Calif.

CLARK, HOYT, JR., (m) Training Specialist, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: Route 7, Box 13, Ft. Worth, Tex.

CLARK, JAMES M., (m) Assist. Gen. Mgr., Manufacturers Aircraft Association, Inc., 30 Rockefeller Plaza, New York 20, N. Y. Home: 151-13 84th Dr., Jamaica 32, N. Y.

CLARK, JAMES W., (s) Polytechnic Institute of Brooklyn, 85 Livingston St., Brooklyn 2, N. Y. Home: 151-13 84th Dr., Jamaica 32, N. Y.

CLARK, JOHN D., (m) Head, Chemistry Branch, USNARTS, Lake Denmark, N. J. Home: Kiel Ave. and Strong Dr., R.D. 2, Boonton, N. J.

CLARK, JOHN RUSSELL, (m) Asst. Chief Engr.-Aircraft Projects, Engineering Department, Chance Vought Aircraft, Inc., P. O. Box 5907, Dallas 22, Tex. Home: 6615 Norway Rd., Dallas, Tex.

CLARK, RICHARD A., (m) MSD Group, Engrg. Dept., Convair, A Division of General Dynamics, San Diego 12, Calif.

CLARK, THOMAS C., (m) Chief of Tech. Planning, Engng. Dept., Hoffman Laboratories, Inc., 3761 S. Hill St., Los Angeles 7, Calif. Home: 10619 Fourth Ave., Inglewood, Calif.

CLARK, WILLIAM E., (m) Research Engineer, Missile Systems Development, Convair, A Division of General Dynamics Corp., Plant #1, San Diego, Calif. Home: 4711 Pocahontas Ave., San Diego 17, Calif.

CLARKE, RODERICK W., (s) Captain USAF, Institute of Technology, USAF, School of Industrial Administration, Box 3244 MCLI, Wright Patterson AFB, O. Home: 216-C Fairchild St., WPAFB, O.

CLAUSEN, JOHN T., JR., (m) Aerophysics Engr., Automatic Controls, Tech. Design, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 4612 Black Oak Lane, Ft. Worth 14, Tex.

CLAUSER, MILTON U., (m) Director, Aeronautical Research Laboratory, The Ramo-Wooldridge Corporation, 8820 Bellanca Ave., Los Angeles 45, Calif. Home: 2737 Palos Verdes Dr., Palos Verdes Estates, Calif.

CLAY, WILLARD R., (m) Assist. Mgr., Research & Development Laboratories, Rheem Mfg. Co., 9236 E. Hall Rd., Downey, Calif. Home: 910 Oakdale Ave., Fullerton, Calif.

CLAYTON, HARRY H., (m) Special Asst. & Test Facil. & Operation, Directorate of Nuclear Systems, ARBC Hdq., USAF, ARDC Office, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 5329 Locke Ave., Ft. Worth, Tex.

CLAYTON, RICHARD M., (m) U. S. Navy, ZX-3 (Airship Development Squadron), NAS Lakehurst, N. J. Home: 97-A Atlantic, Pleasantville, N. J.

CLEAVER, ARTHUR V., (m) Chief Engineer, Rocket Division, DeHavilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex, England.

CLEMENT, GEORGE H., (m) Acting Chief, Missile Div., The Rand Corp., 1700 Main St., Santa Monica, Calif. Home: 520 Seventeenth St., Santa Monica, Calif.

CLEMENTS, JAMES S., (m) Research Engr., North American Aviation, Box 212, Patrick AFB, Fla. Home: Box 159, Rockledge, Fla.

CLEVEN, GALE W., (a) Colonel, USAF, Norton AFB, San Bernadino, Calif. Home: 1550 Arrowhead Ave., San Bernadino, Calif.

CLINGER, GENE E., (s) Santa Monica City College, 1815 Pearl St., Santa Monica, Calif. Home: 2251-D 28th St., Santa Monica, Calif.

CLOTHIER, JACK D., (m) Design Engr., Preliminary Design and Military Relations, Ryan Aeronautical Co., Lindbergh Field, San Diego 12, Calif. Home: 483 Pescadero, San Diego 7, Calif.

COBURN, SEYMOUR K., (a) Chem. Engr., Engng. Division, Association of American Railroads, 3140 S. Federal St., Chicago 16, Ill. Home: 4935 N. Whipple St., Chicago 25, Ill.

COCHRAN, ALEXANDER M., (m) President, Fogging & Dusting Service, Inc., 131 Alexander Ave., Upper Montclair, N. J. Home: 3 Park Terrace, Upper Montclair, N. J.

COCHRAN, DAVID, (m) Gen. Mgr., Aircraft Gas Turbine Development Department, General Electric Company, Cincinnati 15, O. Home: 1288 Crestwood Ave., Cincinnati 26, O.

COCKRELL, WILLIAM D., (m) Control Elect. Engr., Special Defense Projects Dept., General Electric Company, 2900 Campbell Ave., Schenectady 6, N. Y. Home: 334 Terrace Rd., Schenectady 6, N. Y.

CODISPOTI, JOSEPH J., (s) Brooklyn Polytechnic Institute, 85 Livingston St., B'klyn, N. Y. Home: 593 Park Place, B'klyn, N. Y.

COGGAN, BERNARD F., (m) Div. Mgr., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 6436 Camino de la Costa, La Jolla, Calif.

COGSWELL, S. A., (m) Sr. Economist, Chemical Economics Research, Stanford Research Institute, Menlo Park, Calif.

COHEN, DONALD, (s) Los Angeles City College, Los Angeles, Calif. Home: 865 No. Hoover St., Los Angeles 29, Calif.

COHEN, EDWARD C., (s) Polytechnic Inst. of Brooklyn, B'klyn, N. Y. Home: 655 Burke St., New York 67, N. Y.

COHEN, HERBERT L., (m) Engr., AGT Div., General Electric Co., Cincinnati, Ohio. Home 2325 Vera Ave., Cincinnati 13, Ohio.

COHEN, MILTON, (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 2411—32nd St., Santa Monica, Calif.

COHEN, WILLIAM, (m) Head, Component Exploration Section, USNOTS, Code 4512, China Lake, Calif. Home: 1000 A, Richmond, China Lake, Calif.

COLAHAN, WAYNE J., (m) Engr. Res., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 20904 Gresham St., Canoga Park, Calif.

COLE, CHARLES W., (m) Chief Design & Devel. Sect., JPL, California Institute of Tech., 4800 Oakgrove Dr., Pasadena, Calif. Home: 1110 Medford Rd., Pasadena, Calif.

COLE, DANDRIDGE M., (m) Design Specialist, Armament, Glenn L. Martin Co., Denver, Colo. Home: 1280 Estes St., Lakewood, Colo.

COLE, DON E., Missile Engr., Missile Engng., Douglas Aircraft Company, Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 1819 Benecia Ave., Los Angeles 25, Calif.

COLE, MELVIN C., (m) Assist. Proj. Engr., Wright Aero. Div., Curtiss-Wright Corp., Main & Passaic Aves., Wood-Ridge, N. J. Home: 216 So. Salems St., Dover, N. J.

COLE RAY, (m) Lab Assist., Jet Eng. Dept. General Electric Co., Evendale, O. Home: 3760 Reading Rd., Cincinnati 2, O.

COLE, THOMAS E., (m) Research Engr., North American Aviation, Inc., 12214 S. Lakewood Blvd., Downey, Calif. Home: 66-C Quincy Ave., Long Beach 8, Calif.

COLEAL, WILLIAM A., (m) Flight Test Engr., Flight Test Div., Lockheed Aircraft Corp., Palmdale, Calif. Home: 45045 N. 11th St., W. Lancaster, Calif.

COLEMAN, HENRY B., Mgr. Chicago Territory, Aviation & Defense Industries Sales Dept., General Electric Co., 840 So. Canal St., Chicago 80, Ill. Home: 2227 So. 15th Ave., Broadview, Ill.

COLLEN, EDWIN G., (m) Proj. Engr. Kearfott Co., Inc., 1150 McBride Ave., Little Falls, N. J. Home: Woodcrest Rd, Whippany, N. J.

COLLINS, D. T., (m) Weight Analysist, Beech Aircraft Corp., 9709 E. Central, Wichita 1, Kan. Home: 2320 N. Lorraine, Wichita 14, Kan.

COLLINS, FRED J., (s) Purdue University, West Lafayette, Ind. Home: 202½ S. Chauncey, West Lafayette, Ind.

COLLINS, PAUL J., (s) Brooklyn Polytechnic Institute, 85 Livingstone St., B'klyn, N. Y. Home: 1866 Woodbine St., Ridgewood, N. Y.

COLLINS, ROGER W., (s) U. S. Army, Hq. Btry. 1st G.M. Gp. (SAM), Ft. Bliss, Tex. Home: 6115 Brookside Blvd., Kansas City, Mo.

COLLINS, WHITNEY, (m) Chief Engr., Turbine Engng., Continental Aviation & Engineering, 12700 Kercheval, Detroit 5, Mich.

COLT, JOHN Z., (m) Rocket Lab. Group Leader, Bell Aircraft Co., Buffalo, N. Y. Home: 27 Gordon, Williamsville 21, N. Y.

COLWELL, ARCHIE TRESCOTT, (m) Vice Pres., Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, O. Home: 2703 Cranlyn Rd., Cleveland 22, O.

COMER, MASON R., JR., (m) Electronics Tech., Naval Research Lab., Washington, D. C. Home: 2500 Urbana Dr., Silver Springs, Md.

COMPITELLO, FRANK E., (m) Ammunition Design Engr., Picatinny Arsenal, Dover, N. J. Home: Bldg. 13, Apt. 3-A, Jacob Ford Village, Morristown, N. J.

COMSTOCK, RICHARD V., (m) Sr. Research Tech., George Washington University, Research Laboratory, Area B, Camp Detrick, Frederick, Md. Home: P. O. Box 34, Woodsboro, Md.

CONDELLO, VINCENT, Chief Design Engineer, Engineering & Research Div., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 91 Herrick Ave., Teaneck, N. J.

CONDIT, RALPH H., (s) Dept. of Chemistry, Princeton University, Princeton, N. J. Home: 83 Valley Rd., Princeton, N. J.

CONEL, CAROL L., (s) University of California, Berkeley, Calif. Home: 1896 Mountain St., Pasadena, Calif.

CONGER, MARVIN T., (m) Research Chemical Engineer, Research Division, The Goodyear Tire & Rubber Co., Akron, Ohio. Home: 1156 Starwood Ave., Akron 14, Ohio.

CONLON, JOHN W., (m) Senior Service Rep., Reaction Motors, Inc., Denville, N. J. Home: 44117 N. Date Ave., Lancaster, Calif.

CONN, KENNETH D., (m) Chem. & Mech. Lab. Supvr., Proving Grounds, Components Testing, Aerojet-General Corp., Irwindale Rd., Azusa, Calif. Home: 130 Mauna Loa Dr., Monrovia, Calif.

CONNOLLY, JAMES A., JR., (m) Electronic Equipment Specialist, Fire Control Div., Frankford Arsenal, Bridge & Tacony Sts., Phila. 37, Pa. Home: 5911 Tulip St., Phila. 24, Pa.

CONNOR, ROBERT, (s) Proj. Engr., Government Engng., Allen B. Dumont Laboratories, East Patterson, N. J. Home: 649 Hackensack St., Carlstadt, N. J.

CONRAD, ANTHONY L., (m) Manager, Missile Test Project, Executive Section, RCA Service Company, Inc., Patrick Air Force Base, Fla. Home: 80 Riverside Dr., Patrick AFB, Fla.

CONSTABLE, ALFRED F., (s) USAF, 3350 Stu. Sq. (Off.), Box 9093, Chanute AFB, Ill. Home: 242 Claremont Ave., Jersey City, N. J.

CONSTANT, CLINTON, (m) Tech, Asst. Mfg. Dept., Triple Dept., Armour Fertilizer Works' P. O. Box 150, Barton, Fla. Home: 511-W Maxwell St., Lakeland, Fla.

CONVERSE, COURTLAND B., (s) Aero-Hydrodynamicist, Aerodynamics, Grumman Aircraft & Eng. Corp., Bethpage, N. Y. Home: RFD, Boney Lane, St. James, N. Y.

CONVERSE, JOHN W., (a) Test Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 2219 Garfias Dr., Pasadena 7, Calif.

CONYERS, JOHN R., (m) Supvr. Prelim. Design, Rocketdyne, A Division of North Amer. Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 6961 Lindley Ave., Reseda, Calif.

COOK, CHARLES J., (m) Physicist, Stanford Research Institute, Menlo Park, Calif. Home: 488 San Luis Ave., Los Altos, Calif.

COOKSON, ALBERT E., (m) Assoc. Lab. Director, Guided Missile Laboratory, Federal Telecommunication Laboratories, 500 Washington Ave., Nutley, N. J. Home 96 Westland Road., Cedar Grove, N. J.

COOLEY, ROBERT A., (m) Assist. to Research Dept. Mgr., Explosives Div., Research & Development Dept., Olin Mathieson Chemical Corp., East Alton, Ill. Home: 227 Oakley Place, East Alton, Ill.

COOLEY, WILLIAM C., (m) Prin. Engr., Aircraft Nuclear Propulsion Dept., General Electric Co., Cincinnati, O. Home: 8871 Cottonwood Dr., Cincinnati 24, O.

COON, W. EMMETT, (m) Res. Engr., Bomarc Test Section, Pilotless Aircraft Division, Boeing Airplane Co., Box 3107, Seattle 14, Wash. Home: 3757 W. Sullivan, Seattle 6, Wash.

COOPER, EDWIN O., (m) Service Mgr., West Coast Division, Bendix Aviation Corporation, 117 E. Providencia, Burbank, Calif. Home: 12634 Burbank Blvd., Apt. 10, No. Hollywood, Calif.

COOPER, FREDRIC M., (m) Prop. Engr., Advance Airframe Engng., Special Defense Projects Dept., 3198 General Electric Co., Chestnut St., Philadelphia, Pa. Home: 95 Brent St., Albany 5, N. Y.

COOPER, GUY F., (s) Purdue University, Lafayette, Ind. Home: RFD #2, Plattsburg, N. Y.

COOPER, HOMER V., JR., (m) Group Leader — Flight Test, Missile Devel. Div., North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 15158 El Soneto Dr., Whittier, Calif.

COOPER, JOSEPH, (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 1988 E. 16th St., Brooklyn 23, N. Y.

COOPER, RICHARD M., (s) Home: 1360 Monaco Drive, Pacific Palisades, Calif.

COPE, NEVIN H., (m) Design Engr. — Power Plant, Pilotless Aircraft Division, Boeing Airplane Company, 7755 E. Marginal Way, Seattle 14, Wash. Home: 5027—18th N.E., Seattle 5, Wash.

COPLEN, HERMAN L., JR., (m) Prin. Engr., Systems & Controls Dept., Aerojet-General Corp., Box 1947, Sacramento, Calif. Home: 4220 Winding Creek Rd., Sacramento 21, Calif.

CORBETT, ALBERT D., JR., (m) Assist. Proj. Engr., Rocket Dept., Curtiss-Wright Corp., Caldwell, N. J. Home: 28 Sunnie Terr., W. Caldwell, N. J.

CORDES, ORVILLE A., (m) Sales Mgr., Accessory Products Corp., 616 W. Whittier Blvd., Whittier, Calif. Home: 533 Sunset Rd., Glendale 2, Calif.

CORDES, WILLIAM A., (s) University of Minnesota, Minneapolis, Minn. Home: 966 South Robert, West St. Paul 7, Minn.

CORNILLON, JACQUES M., US Tech. Rep., Societe Nationale de Constructions Aeronautics du Sud-Quest, 105 Avenue Raymond Poincare, Paris 16, France. Home: Twin Willows, Point Pleasant, Pa.

CORNOG, ROBERT A., (m) Tech. Staff, Guided Missile Research Division, Ramo-Wooldridge Corp., 8820 Bellanca Ave., Los Angeles 45, Calif. Home: 10609 Flaxton St., Culver City, Calif.

CORNWELL, ROY S., (m) LCDR, U. S. Navy, VC-4, NAS, Atlantic City, N. J. Home: 130 E. Groveland, Somers Point N. J.

CORRIVEAUX, FRANK, (m) Foreman, Atomic Power Equipment Div., General Electric Co., Campbell Ave. Plant, 2900 Campbell Ave., Schenectady, N. Y. Home: 2347 Lawnwood Ave., Schenectady 4, N. Y.

CORSO, JOHN S., (s) Acadmy of Aeronautics, LaGuardia Airport, N. Y., Home: 8780 19th Ave., Brooklyn 14, N. Y.

COSGROVE, GEORGE J., (s) Lehigh University, Bethlehem, Penna. Home: 106 South St., Port Jefferson, N. Y.

COSNER, DONALD L., (m) Sr. Engr., Aerodynamics Dept., The Glenn L. Martin Co., Baltimore 3, Md. Home: Baldwin, Md.

COSS, FRANK A., (m) Sr. Proj. Engr., Liquid Rocket Plant, Aerojet-General Corp., Box 1947, Sacramento, Calif. Home: 121 Broadview, Auburn, Calif.

COSTELLO, JOHN R., (a) Res. Analyst Experimental Development, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 13028½ Burbank Blvd., No. Hollywood, Calif.

COSTILOW, ELEANOR L., (m) Aeronautical Research Scientist, Rocket Branch—Fuels & Combustion Div., NACA—Lewis Flight Propulsion Laboratory, 21000 Brookpark, Cleveland 7, O. Home: 1604 Marlowe, Lakewood 7, O.

COTTLER, DUDLEY M., (m) Assist. Engng., Signal Corps Agency, WSPG, N. M. Home: 1790 S. Chaparro, Las Cruces, N. M.

COUBROUGH, ROBERT J., (m) Engr. Res., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 4460 Hazeltine, Van Nuys, Calif.

COUTANT, JAY G., (m) Secretary and Asst. Treas., Phoenix Iron & Steel Company, P. O. Box #149, Phoenixville, Pa. Home: 200 Ithan Ave., Apt. "D", Villanova, Pa.

COUTS, ROBERT J., (m) Mgr., Design Engr. Aerophysics Dept., Goodyear Aircraft Corp., 1210 Massilon Road, Akron 15, O. Home: 878 Kennebec Ave., Akron 5, O.

COUTURE, WARREN A., (s) Indiana Tech. College, Ft. Wayne, Ind.

COWEN, JOHN B., (m) Director of Government Operations, Aerojet-General Corp., 1625 Eye St., N.W., Washington, D. C. Home: 8016 Hampden Lane, Bethesda, Md.

COWGILL, EDWARD L., (m) Bell Aircraft Corp., P.O. Box 1, Buffalo, N. Y. Home: Creek Road, Youngstown, N. Y.

COWLES, LOGAN B., (m) Manager, Structures & Auxiliaries Engr., Special Defense Projects Dept., General Electric Co., 2900 Campbell Ave., Schenectady, N. Y. Home: 2056 Coolidge Pl., Schenectady 9, N. Y.

COX, GEORGE E., (m) Project Engr., Becco Chemical Div., Food Machinery & Chemical Corp., Station "B", Buffalo, N. Y. Home: 289 Tennyson Ter., Williamsvills, N. Y.

COX, JOHN, (m) Engr., North American Aviation, Inc., Los Angeles, Calif. Home: Box 2, Bell, Calif.

COX, WILLIAM T., (m) Head of Department, Solid Engine Department, Aerojet-General, Azusa, Calif. Home: 565 E. Cucamonga Ave., Pomona, Calif.

CRABTREE, CHARLES F., (m) Sr. Design Engr., Convair, A Div. of General Dynamics, Ft. Worth, Tex. Home: 2405 Michael, Ft. Worth 3, Tex.

CRABTREE, DONALD, (s) Purdue Jet Propulsion Center, Purdue University, W. Lafayette, Ind. Home: 424 So. 20th St., Richmond, Ind.

CRAIG, DAVID J., (m) Res. Engr., Gas Turbine Department, Scientific Laboratory, Ford Motor Company, Dearborn, Mich. Home: 9960 Park Ave., Allen Park, Mich.

CRAIG, DONALD E., (m) Assist. Mech. Engr., Minicard Dept., Magnavox Co., Bueter Rd., Ft. Wayne, Ind. Home: 3405 Smith St., Ft. Wayne, Ind.

CRAIG, GEORGE H., (m) Sr. Systems Installation Engr., Engng. Dept., Convair, A Division of General Dynamics Corporation, Ft. Worth Division, Ft. Worth 1, Tex. Home: 6113 Sharon Rd., Ft. Worth 16, Tex.

CRAMER, FRANK B., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 19123 Strathern St., Reseda, Calif.

CRAMER, GRANVILLE R., (m) Ast. Proj. Engineer, Reaction Motors, Inc., Denville, N. J. Home: 32 Sylvan Dr., Morris Plains, N. J.

CRAMPTON, ALTON B., (m) Sec. Head, Esso Research & Engineering Co., Linden, N. J. Home: 814 Embree Crescent, Westfield, N. J.

CRANE, FRED E., (m) Aero. Gas Turbine Power Plants Test Engr., Special Projects Group, Jet Prop. Sec., Aero. Eng. Lab., Naval Air Experiment Sta., Philadelphia Naval Base, Philadelphia 12, Pa. Home: 241 South 49th St., Philadelphia 39, Pa.

CRASK, JAMES A., (m) Proj. Engr., Technical Development Br., Phillips Petroleum Co., McGregor, Tex. Home 4712 Cole, Waco, Tex.

CRAWFORD, RUSSELL W., (a) Electrical Engineering Dept., The Ohio State University, Columbus 10, O. Home: 2604 Putnam Rd., Apt. F, Columbus 10, O.

CRAWFORD, SAMUEL W., (m) Requisitions Engr., Guided Missile Dept., General Electric Company, 1 River Rd., Schenectady, N. Y. Home: 411 Vley Rd., Scotia, N. Y.

CREMER, GEORGE D., (a) Sr. Staff Engr., Powder Metallurgy Dept., Solar Aircraft Co., Pacific Highway, San Diego, Calif. Home: 8540 Troy St., Lemongrove, Calif.

CRIDER, LOUIS D., (a) Chief Packaging & Corrosion, Conrol Section, Cheli Air Force Station, P. O. Box 310, Maywood, Calif. Home: 735 E. Beckville St., Duarte, Calif.

CRIPLIVER, C. (Charles) ROGER, (a) Engng. Publications Editor, Service Engineering Section, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 617 Rosemere Ave., Ft. Worth 11, Tex.

CRISPANO, ALAN J., (m) Engr., Boeing Airplane Co., 217 N. Water St., Wichita, Kan. Home: 3202 E. 2nd St., Wichita, Kan.

CROCCO, LUIGI, (f) Robert H. Goddard Professor, Princeton University, Princeton, N. J. Home: 74 College Rd., Princeton, N. J.

CROCKER, ALBERT R., (a) Mgr.—Test Operations, Idaho Test Station, Aircraft Nuclear Propulsion Dept., General Electric Co., Box 535, Idaho Falls, Idaho. Home: 2825 E. Morningside Dr., Idaho Falls, Idaho.

CROFT, JACOB C. JR., Senior Mechanical Engr., Western Div., Technical Gr., Creole Petroleum Corp., Apt. #172, Maracaibo, Venezuela, S. A., Home: P. O. Box 2471, Roanoke, Virginia

CROFUT, EDWARD G., (m) President & Dir. of Engng., Aerolab Development Co., Inc., a subsidiary of U. S. Hoffman Mach'y Corp., 330 W. Holly St., Pasadena 3, Calif.

CROMPTON, GEORGE JR., Patent Attorney, Patent Department, Norton Company, 1 New Bond St., Worcester 6, Mass. Home: 54 Mill St., Framingham Centre, Mass.

CRONE, JOHN L., (m) Chief, Physical Res. Div., National Security Agency, Washington, D. C. Home: 3522 Nimitz Rd., Kensington, Md.

CROOK, NORMAN L., (m) Sr. Group Engineer, Temco Aircraft Corp., P. O. Box 6191, Dallas, Tex. Home: 3425 Bogata Blvd., Dallas, Tex.

CROOKS, JAMES W., JR., (m) Engng. Design Specialist, Eng. Dept., Convair, A Division of General Dynamics Corp., San Diego 12, Calif. Home: 4720 Atlanta Dr., San Diego 15, Calif.

CROOKS, JOHN R., (m) Chem. Engr., Production Dept., U. S. Naval Powder Factory, Indian Head, Md. Home: 5 Cornwallis Ct., Indian Head, Md.

CROSSLAND, WINFORD D., (m) Group Leader, Engng. Test Sec., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 17150 Vose, Van Nuys, Calif.

CROTTY, WALTER J., JR., (m) Engr., Aero Engineering Co., Div. of Garrett Corp., 2510 St. Paul St., Baltimore 18, Md. Home: 5902 Edna Ave., Baltimore 14, Md.

CROWE, THOMAS J., (s) Pasadena City College, 1570 E. Colorado St., Pasadena 4, Calif. Home: 18 Le Roy Ave., Arcadia, Calif.

CRUM, EARL M., JR., (m) Engr., The Glenn L. Martin Co., Baltimore 3, Md. Home: 27-A Westway N., Riverdale Apts., Baltimore 21, Md.

CRUM, JOHN O., (m) Technical Staff, Guided Missiles Research Div., Ramo-Wooldridge Corp., 8820 Bellanca Ave., Los Angeles 45, Calif. Home: 8359 Kenyon Ave., Los Angeles 45, Calif.

CRUNDEN, ALLAN B. J., (a) CAA Medical Examiner for Air Transport Ratings, Dept. of Commerce, 333 Park St., Upper Montclair, N. J. Home: 30 Porter Place, Montclair, N. J.

CSILLAG, LOUIS M., (m) Sr. A Draftsman, W. L. Maxson Corp., 460 West 34th St., New York 1, N. Y. Home: 414 Riverside Dr., N. Y.

CUDDY, WILLIAM ANTHONY, (m) Proj. Leader, Wyandotte Chemicals Corp., Wyandotte, Mich. Home: 9290 Melbourne, Allen Park, Mich.

CUDHEA, GEORGE G., (m) Assist. Mgr. Fleetwings Div., Kaiser Metal Products, Inc., Bristol, Pa. Home: 411 Crown St., Morrisville, Pa.

CULLEN, ROBERT E., (m) Assoc. Res. Engr., University of Michigan, Ann Arbor, Mich. Home: 2011 Eastover Pl., Ann Arbor, Mich.

CULLINANE, HENRY J., (s) New York University, University Heights, N. Y. Home: 3709 Secor Ave., Bronx 66, N. Y.

CULP, DONALD H., (m) Ass't Foreman, 68 Functional Test Lab., Bell Aircraft Corp., Buffalo, N. Y. Home: Walmore Rd., Rt. 1, Niagara Falls, N. Y.

CULP, DONALD WILLIAM, (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: Box 145, Rushsylvania, O.

CULVER, IRVING, (m) Engr., Systems Devel. Div., Lockheed Aircraft Corp., Box 2121, Van Nuys, Calif. 7701 Woodley Ave., Van Nuys, Calif.

CULVERWELL, CLIFFORD H., (m) Rocket Lab. Tech., Bell Aircraft Corp., Niagara Falls, N. Y. Home: Daniels Rd., Wilson, N. Y.

CULVERWELL, JAMES F., (a) Engr., P. O. Box 5561, Los Angeles 14, Calif.

CUMMING, JAMES M., (m) Proj. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 4571 Comber Ave., Encino, Calif.

CUMMINGS, CLIFFORD I., (m) Section Chief, Guidance Systems Sec., JPL, Calif. Inst. of Tech., 4800 Oak Grove Dr., Pasadena, Calif. Home: 1205 Medford Rd., Pasadena, Calif.

CUNNINGHAM, GEORGE M., (m) District Sales Mgr., Industrial Chemicals Div., Olin Mathieson Chemical Corporation, The 3848 E. Colorado St. Bldg., Pasadena 8, Calif. Home: 3514 Grayburn Rd., Pasadena 10, Calif.

CURDTS, WILLIAM T. III, (m) Vice Pres. & General Mgr., Flight Research, Inc., Box 1-F, Richmond 1. Va. Home: 5114 Franklin St., Richmond 26, Va.

CURRAN, LOUIS J., (a) Owner & Chief Mechanical Engr., Curran Engng. Co., 4423 W. Jefferson Blvd., Los Angeles 16, Calif. Home: 758 N. Orange Dr., Hollywood 38, Calif.

CUSHING, VINCENT J., (m) Mgr., Prop. Res., Armour Research Foundation, 10 W. 35th St., Chicago, Ill. Home: 1040 Cherry St., Winnetka, Ill.

CUSTER, RANDALL M., (m) Prod. Mgr., Genisco, Inc., 2233 Federal Ave., Los Angeles 64, Calif. Home: 3268 Grandview Blvd., Los Angeles 66, Calif.

CUTTING, JOHN B., (m) Product Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: P.O. Box 111, Sparta, N. J.

D

DAHL, RUDOLPH, (m) Washington Representative, Aerojet-General, Corp., Azusa, Calif. Home: 4419 Bradley Ln., Chevy Chase 15, Md.

DAHLKE, HANS J., (s) San Diego State College, San Diego, Calif. Home: 5177 Bocaw Pl., San Diego, Calif.

DAILEY, WILLIAM A., (m) Engr., USAF, Power Plant Lab., Wright Air Devel. Center, WCIPR, Wright-Patterson AFB, O. Home: ACCA "B", P. O. Box 7402, Wright-Patterson AFB, O.

D'ALLI, SEBASTIAN J., (m) Missile Test Engr., Boeing Airplane Co., Box 820, Melbourne, Fla. Home: Rte. 2, Box 351, Cocoa, Fla.

D'AMATO, DOMINIC A., (a) Proj. Engr., Ammunition Research Div., Olin Mathieson Chemical Corp., Winchester Ave., New Haven, Conn. Home: 8 Brubaker Rd., Cheshire, Conn.

DANFORTH, CLARENCE E., (m) Stress-Vibration Consulting Engineer, Aircraft Gas Turbine Division, General Electric Co., Cincinnati 15, O. Home: 661 Ghelson Ave., Apt. 7, Cincinnati 29, O.

DANN, JOSEPH A., (m) Res. Engr., Missile Systems Division, Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 1607 Porto Rico, Alamogordo, N. Mex.

DANNENBERG, KONRAD K., (m) Chief, Engng. Liaison Office, Development Operations Division, Army Ballistic Missiles Agency, Redstone Arsenal, Huntsville, Ala. Home: 1911 Thornton Circle, Huntsville, Ala. OR 5901 Junilla Ave., Woodland Hills, Calif.

DAOUSSIS, SPYROS, (m) Proj. Engr., Government & Industrial Div., Philco Corporation, 4700 Wissahickon Ave., Phila., Pa. Home: 475 Barker Rd., Springfield, Pa.

DA PUZZO, ANDREW V., (s) New York University, New York 53, N. Y. Home: 403 First St., Hoboken, N. J.

DARLING, BRADFORD, (m) D.I.C. Staff Member, Mass. Inst. of Tech., Bldg. 31A, Cambridge 39, Mass. Home: 150 High St., Winchester, Mass.

DATNER, PAUL P., (m) Aerobrake Proj. Engr., Aerojet-General Corp., Azusa, Calif. Home: 420 South Leaf Ave., West Covina, Calif.

DAUWALTER, CHADWICK S., (a) Calif. Institute of Tech., Pasadena, Calif. Home: 406 S. Chester, Apt. 4, Pasadena 5, Calif.

DAVENPORT, MICHAEL N., (s) 8014 Broadleaf Ave., Van Nuys, Calif.

DAVEY, GEORGE R., (m) Res. Engr., North American Aviation, Inc., Santa Susana, Calif. Home: 23330 Oxnard St., Woodland Hills, Calif.

DAVIDSON, ALLEN R., JR., (s) Purdue University, West Lafayette, Ind. Home 3422 Argyle Dr., Erie, Pa.

DAVIDSON, ROBERT L., (m) Assoc. Editor, Petroleum Processing, McGraw-Hill Publishing Co., 330 West 42nd St., New York 36, N. Y. Home: 14 Riveredge Rd., Red Bank, N. J.

DAVIDSON, WILLIAM M., (m) Mgr., Applications Engng., Customer Relations & Contracts Division, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 57 Briarcliff Rd., Mt. Lakes, N. J.

DAVIES, CLARENCE E., (m) Secretary, American Society of Mechnical Engineers, 29 W. 39th St., New York 18, N. Y. Home: 32 W. 40th St., New York 18, N. Y.

DAVIES, HENRY E., JR., (m) Lt., U. S. Navy. Home: 936 Suburban Pkwy, Portsmouth, Va.

DAVIES, WILLIAM O., (m) Physicist, Firestone Tire & Rubber Co., Defense Research Div., 1200 Firestone Parkway, Akron 18, O. Home: 80 W. Center St., Akron 8, O.

DAVILA, APONTE, JESUS, (a) Cosmic Ray Research Associate, Physics Department, University of Puerto Rico, Rio Piedras, Puerto Rico. Home: Ave. Universidad #53, Rio Piedras, Puerto Rice.

DAVIS, EARL C., (m) Field Engr., Neely Enterprises, 404 Hoagland Rd., Las Cruces, N. M.

DAVIS, FRANK W., (m) Chief Engr., Convair, A Div. of General Dynamics Corp., Grant's Lane, Ft. Worth, Tex. Home: 6328 Curzon Ave., Ft. Worth 7, Tex.

DAVIS, HAROLD, (m) Home: 146 Walter Nash Rd., Kidderminster, England.

DAVIS, HARRY S., (m) Mathematician, Flight Simulation Br., Electro Mechanical Labs., Civil Service, U. S. Ordnance Corp., White Sands Proving Ground, N. M. Home: 1109 Lees Dr., Las Cruces, N. M.

DAVIS, HUGH J., (m) Design Specialist, Boeing Airplane Co., Seattle, Wash. Home: 5648 Beach Dr., Seattle 16, Wash.

DAVIS, JIMMIE A., (m) Design Engr., Aerojet-General Corp., P.O. Box 1947, Sacramento, Calif. Home: 2060 Red Robbin La, Apt. D, Sacramento, Calif.

DAVIS, JOHN F., (m) Field Engr., Neely Enterprises, 7422 Melrose Ave., Los Angeles 46, Calif. Home: 404 Hoagland Rd., Las Cruces, N. M.

DAVIS, JOHN T. R., (s) Purdue University, W. Lafayette, Ind. Home: 1028 State St., W. Lafayette, Ind.

DAVIS, LEIGHTON I., (m) Brig. General USAF, Holloman Air Development Center, Air Research & Dev. Command, Box 1068, Holloman AFB, N. M.

DAVIS, NOAH S., (m) Mgr. Special Projects, Becco Chem. Div., Food Machinery & Chem. Corp., Station B, Buffalo 7, N. Y. Home: 54 Linden Ave., Buffalo 14, N. Y.

DAVIS, ROBERT E., (m) Senior Engr., Solid Eng. Dept., Aerojet-General Corp., Azusa, Calif. Home: 1116 Broadmoor Dr., West Covina, Calif.

DAVIS, WILLIAM A., JR., (m) Ordnance Engr., Industrial Div., Redstone Arsenal, Huntsville, Ala. Home: Rt. 4, Box 233, Huntsville, Ala.

DAWLEY, RICHARD E., (s) Indiana Technical College, 223 East Washington Blvd., Ft. Wayne, Ind. Home: 924 S. Monroe, Ft. Wayne, Ind.

DAY, DONALD R., (s) Lead Draftsman, Tech. Products Division, Farnsworth Electronics Co., 801 Knitters Ave., Ft. Wayne, Indiana. Home: 1609 Beach St., Ft. Wayne, Ind.

DEACON, WILLIAM S., (m) Missile Sales Mgr., Sales Dept., Marman Products Company, Inc., 11214 Exposition Blvd., Los Angeles 64, Calif. Home: 3723 Globe Ave., Los Angeles 34, Calif.

DEAN, A., (m) Res. Engr., Aerophysics Development Corp., 452 Fourth St., Santa Monica, Calif. Home: 6116 Romaine St., Apt. 5, Hollywood 38, Calif.

DEAN, E. DOUGLAS, (m) Test Specialist, Project Director, Test Development Div., Research Div., Educational Testing Service, P. O. Box 213, Princeton, N. J. Home: 32 Bank St., Princeton, N. J.

DEAN, JAMES M., (s) California State Polytechnic, Box 909, San Luis Obispo, Calif. Home: 1706 Grier, Pomona, Calif.

DEAN, LEO E., (m) Development Engr., Liquid Rocket Plant, Aerojet-General Corp., Sacramento, Calif. Home: 2844 Santa Paula Crts., Sacramento 21, Calif.

DE AVIES, EMMETT G., (m) First Lieutenant, 63rd Fighter Interceptor Squadron, United States Air Force, O'Hare International Airport, Park Ridge, Ill.

DE BACKER, THEODORE A., (m) Reactor Control Engr., Application Engng., Minneapolis-Honeywell Regulator Co., Wayne & Windrim, Philadelphia 44, Pa. Home: 219 E. Willow Grove Ave., Phila., Pa.

de BOER, JAN JACOB, J. J., (a) Mgr. Westrex Co. Caribbean, Carrera 5, #19-40, Bogota, Columbia, S. A. Home: Carrera 14, 85-68, Bogota, Columbia, S. A.

DE BOY, WILLIAM H., (m) Major, U. S. Army, Chemical Corps, Chemical & Radiological Labs., Army Chemical Center, Md.

DEBUS, KURT H., (m) C.A. Missile Firing Lab., Redstone Arsenal, Huntsville, Ala. Home: Rt. 4, Box 265, Huntsville, Ala.

de CALLIES, RICHARD N., (m) Sr. Project Engr., Naval Air Test Center, Patuxent River, Md. Home: Hines Rd. Box 390, Glenarm, Md.

DEDEN, JOHN T., (m) Sr. Engr. Production Design, Aeronautical Division, Minneapolis-Honeywell Regulator Co., 1915 Armacost Ave., West Los Angeles 25, Calif. Home: 23546 Hatteras St., Woodland Hills, Calif.

DE FORD, HAROLD L., (a) Chem. Engr., Pilot Plant, Johnson & Johnson Research Ctr., Route #1, New Brunswick, N. J. Home: A-30 Thomas Blvd., New Brunswick, N. J.

DeFREES, ROBERT E., (m) Proj. Engr., Research & Development, Bendix Products Division, South Bend, Ind. Home: 808 S. Ironwood Dr., Mishawaka, Ind.

de GENNARO, T. R., (m) Assoc. Engr., Missile Div., Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 1083 S. Plymouth Blvd., Los Angeles, Calif.

DEKKER, ALBERT O., (m) Assoc. Director of Chem., Propellant Development Dept., Aerojet-General Corp., Azusa, Calif. Home: 2770 Porter Ave., Altadena, Calif.

DE LA MATER, EDWARD J., (m) Mfg. Engr., Production Engng., Hughes Aircraft Co., Nogales Highway, Tucson, Ariz. Home: 4318 E. Whitman, Tucson, Ariz.

DELANEY, JERE T., Eng. Thermodynamicist, North American Aviation, Inc., 4300 E. 5th Ave., Columbus 16, Ohio. Home: 1458 Highland St., Columbus 1, Ohio.

DELANEY, MICHAEL J., (s) Hunter College, Bedford Park Blvd., Bronx, N. Y. Home: 103 Thayer St., New York 40, N. Y.

DELATEUR, LOUIS A., Control Engr., AIW Control Section, Westinghouse Atomic Power Division, P.O. Box 1526, Pittsburgh 30, Pennsylvania. Home: 790B Cooke Drive, Pittsburgh 34, Pa.

de LECEA, ALBERTO M., (m) Mgr. Director, Engr. I.C.A.I., Pirotecnia Lecea, S. A Home: Apartadeo 26, Vitoria, Spain

DELL, LOUIS C., (m) Project Engr. & Consultant, Self-employed as Consulting Engr., 544 E. Magnolia Blvd. Home: Burbank, Calif.

DeLORME, JEAN, (m) Pres., Ste. Air Liquide, 75 Quai D'Orsay, Paris, France. Home: 10 Bd. Luchet, Paris.

DELSON, ERWIN, B., (a) Prod. Engr., ANP Dept., General Electric Co., Box 132, Cincinnati 15, O. Home: 7854 Kirkland Dr. Cincinnati 31, O.

DELVAL, GEORGES T., (m) Attache to Tech. Bd., Societe Nationale de Constructions Aeronautiques du Sud Ouest, 2 Rue de Larnac Courbevoie, Seine, France.

DE MARCO, MICHAEL F., (a) Instructor, Aircraft Accessories Dept., Academy of Aeronautics, LaGuardia Airport, Flushing 71, N. Y. Home: 256 Schenectady Ave., Brooklyn 13, N. Y.

DEMAREST, VAN-BUSKIRK, JR., (a) A/2c, US 12429143, 380th F.M.S. (FieldMaint. Sqd)., 380th Bomb Wg., Plattsburgh AFB, Plattsburg, N. Y. Home: 260 Durie Ave., Closter, N. J.

DEMBROW, DANIEL W., (s) Chem., Applied Physics Laboratory, Johns Hopkins University, 8621 Georgia Ave., Silver Spring, Md. Home: 12509 Two Farm Dr., Silver Spring, Md.

DEMETRIADES, STERGE T., (m) Consultant, Aerojet-General Corp., Azusa, Calif. Home: 551 So. Hill, Pasadena, Calif.

DEMPSEY, JAMES R., (m) Program Director, WS-107A Project, Convair, A Division of General Dynamics Corporation, 3302 Pacific Highway, San Diego 12, Calif. Home: 7236 Country Club Dr., La Jolla, Calif.

DE MUTH, FRED F., (m) Group Leader, Applied Mechanics, Res. Dept., Detroit Controls Corp., 1650 Broadway, Redwood City, Calif. Home: 461 La Mesa Dr., Menlo Pk., Calif.

DE NIKE, JOHN, Asst. Project Engr., Advance Design Dept., Glenn L. Martin Co., Baltimore 3, Md. Home: Monkton, Md.

DENMAN, JOHN B., (s) University of Michigan, Ann Arbor, Mich. Home: Brick Hill Rd., Orleans, Mass.

DENNIS, BERNARD K., (a) Presentation Specialist, AGT Division, General Electric Co., Cincinnati 15, O. Home: 5542 Bosworth Pl., Cincinnati, O.

DENNIS, JOHN E., (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 256 Milford Ave., New Milford, N. J.

DEPTULA, JOSEPH J., (m) Installations Engr., Rocket Department, Bell Aircraft Corp., P. O. Box One, Buffalo 5, N. Y. Home: 538-B Allenhurst Rd., Buffalo 23, N. Y.

DERROM, DONALD L., (m) Assist. Director General, Cementos Anahvac, S. A., P. O. Box 18, Barrientos, Mex. Home Avenida Chapultepec 411, Mexico 6, DF., Mexico.

DeSAVINO, WM. A., (m) Research Engr., North American Aviation, Inc. Rocket Eng. Div., Downey, Calif. Home: 12825 Morning Ave., Downey, Calif.

de SEVERSKY, ALEXANDER P., (m) Aeronautical Consultant, 30 Rockefeller Plaza, New York 20, N. Y. Home: Asharoken Beach, Northport, L. I., N. Y.

DesLAURIER, EMILE J., (m) Field Serv. Engr., Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles, Calif. Home: 3125 Van Buoven, El Paso, Tex.

DESSLER, ALEXANDER J., (m) Sr. Scientist, Missile Systems Div., Lockheed Aircraft Corp., Van Nuys, Calif. Home: 10930 Orion Ave., Granada Hills, Calif.

DETJEN, WALTER A., (m) Proj. Coordinator, Rocket Eng. Test Lab., Edwards Air Force Base, Edwards, Calif. Home: 408 West Ave. J-9, Lancaster, Calif.

DEUEL, GLEN A., (m) Mech. Engr., Redstone Arsenal GMDD, Structures & Mechanics Lab., Huntsville, Ala. Home: 231 Crestline Rd., Huntsville, Ala.

DEWART, ALAN C., (a) Asst. Highway Engr., Division of Highways, State of California, 150 Oak St., San Francisco, Calif. Home: 220 Golden Gate Ave., San Francisco, Calif.

DEXTER, FREDERICK V., (m) Product Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 1713 Springbrook Trail, Sparta, N. J.

DEYARMOND, ALBERT B., (m) Chief, Prelim. Design, Engng. Div., Ryan Aeronautical Co., Harbor Dr., San Diego 12, Calif. Home: 1007 Peerless Dr., El Cason, Calif.

DEZUBAY, EGON A., (m) Combustion Sec. Head, Research Division, Curtiss-Wright Corporation, Brighton Rd., Clifton, N. J. Home: 609 Larch Ave., Fairlawn, N. J.

DIACATOS, PHILIP, (m) Intermediate Test Engr., Wright Aero Div., Curtiss-Wright Corp., Wood Ridge, N. J. Home: 603 W. 180th St., N. Y. 33, N. Y.

DIAKOFF, ALEXIS J., (m) Consulting Engr., American Locomotive Co., Diesel Div., Schenectady 5, N. Y. Home: 959 St. David's Lane, Schenectady 9, N. Y.

DIAMOND, PHILIP M., (m) Res. Assist., Jet Propulsion Center, Purdue University, W. Lafayette, Ind. Home: 146 E. Stadium Ave., W. Lafayette, Ind.

DICKERSON, MELVIN R., (m) Technical Writer, EOD Marketing, General Electric Co., Evendale, O. Home: 76 Sunset Drive, Highland Heights, Ky.

DICKEY, FORREST B., (m) Design Engr., Missile Development, Bendix Pacific Co., 11600 Sherman Way, North Hollywood, Calif. Home: 801 Irving Dr., Burbank, Calif.

DIEDRICH, GEORGE, (a) Mathmetics Aid, N.A.C.A., 21000 Brookpark Rd., Cleveland, O. Home: 653 Weller Rd., Elyria, O.

DIELS, MELVIN F., (m) Sr. Engr., Aero. Div., Minneapolis-Honeywell Regulator Co., 2600 Ridgway Rd., Mpls. 13, Minn. Home: 4016 Idaho Ave., No. Mpls. 27, Minn.

DIENST, EUGENE K., (a) Home: P.O. Box 1462, Colorado Springs, Colo.

DIERUF, BURTON E., (m) Staff Member, Division 1223, Sandia Corporation, Sandia Base, Albuquerque, N. M. Home: 9917 Leyendecker Rd. N.E., Albuquerque, N. M.

DIETZ, JOSEPH L, (s) Test and Devel. Engr., Materials Laboratory, Chrysler Corp., P. O. Box 2628, Detroit 31, Mich. Home: 712 Chalmers, Detroit 15, Mich.

DILLON, OSCAR W., (s) Institute of Flight Structures, Columbia University, New York 27, N. Y. Home: 1008 Furnald Hall, Columbia Univ., New York 27, N. Y.

DILLON, THOMAS P., (a) Ass't. Mgr., Retail Dept. Monroe Hardware Co., Monroe, N. C. Home: 1200 W. Franklin St, Monroe, N. C.

DINGMAN, EDWARD H., (m) Assist. to Branch Chief, M. B. G. & C., White Sands Proving Ground, N. M. Home: 1010 N. Armijo St., Las Cruces, N. M.

DIVINE, LAURENCE A., (m) Field Service Engr., Sales and Service Dept., Glenn L. Martin Co., Baltimore 3, Md. Home: 209-C Donnybrook, La., Towson 4, Md.

DIVONE, LOUIS V., (m) Aeronautical Engng. Dept., Massachusetts Institute of Technology, Cambridge 39, Mass. Home: 467—81 St., Brooklyn 9, N. Y.

DIXON, THOMAS F., (m) Chief Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga & Vandwen, Canoga Park, Calif. Home: 4923 Winnetra, Woodland Hills, Calif.

DOBBINS, LT. EDWARD B., (s) Redstone Field Service Rep., Gilfillan Bros., 1815 Venice Blvd., Los Angeles, Calif. Home: 414 C Hof Circle, Huntsville, Ala.

DOBI, NICHOLAS S., (m) Aero. Design, Develop., Research Engr., Civil Aero. Board, Constitution and 17th St., Wash. 25, D. C. Home: 1723 Keokee St., Hyattsville, Md.

DOCTER, JOHN C., (a) President, Agricultural Supply Inc., Thorntown, Ind. Home: 1506 Park Dr., Lebanon, Ind.

DODGE, CHARLES H., (m) Assist. Sr. Engr., Liquid Eng. Div., Aerojet-General Corp., Azusa, Calif. Home: 3601 Yorkshire Rd., Pasadena 10, Calif.

DOFTER, EDWARD J., (m) Head, Materials, Missile Operations, Chrysler Corporation, P. O. Box 2628, Detroit 31, Mich. Home: 4831 Burnley Dr., Birmingham, Mich.

DOHERTY, THOMAS J., (a) President-Director, Indialantic Hotel Corp., Melbourne, Fla. Home: Trade Winds Club, Melbourne, Fla.

DOLGONAS, GENE (m) Prin. Engr., Solid Engine Department Dept., Aerojet-General Corporation, P. O. Box 296, Azusa, Calif. Home: 3755 Fairmeade Rd., Pasadena, Calif.

DOLINGER, SHELDON, (m) Analysis Engr., Research Department, United Aircraft Corporation, Silver Lane, East Hartford, Conn. Home: 69 Tower Ave., Hartford, Conn.

DOMOKOS, STEVE J., (m) Res. Engr., North American Aviation, Inc., Aviation Propulsion Field Lab., Santa Susana, Calif. Home: 5151 Veloz Ave., Tarzana, Calif.

DONALDSON, CHARLES W., (m) Des. Engr., Missile Development Div., North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 8811 E. Mines Ave., Rivera, Calif.

DONIVAN, HENRY C., (m) Chief, Engng. Section, Liquid Propellant Br., Ordnance Corps., WSPG, N. M. Home: 1709 S. Chaparro St., Las Cruces, N. M.

DONLEY, EDWARD, (m) Sales Mgr., Sales Dept., Air Products, Incorporated, P.O. Box 538, Allentown, Penna. Home: 140 Jefferson St., Emmaus, Penna.

DONNELLY, HAROLD GEO., Dept. Head, Chemical & Metallurgical Engineering, Wayne University, 664 Putnam, Detroit 2, Mich. Home: 7560 Esper Blvd., Dearborn, Mich.

DONNENWORTH, CREIGHTON T., (m) Rocket Test Group Leader, Test Dept. — Engineering Div., Bell Aircraft Corp., P. O. Box #1, Buffalo 5, N. Y. Home: 2499 Pierce Ave., Niagara Falls, N. Y.

DONOVAN, ALLEN F., (m) The Ramo-Wooldridge Corp., 6750 Arbor Vitae St., Los Angeles, Calif. Home: 1071 Villa View, Pacific Palisades, Calif.

DOOLEY, DONALD A., (m) Sr. Res. Engr., Preliminary Design, Missile Development Division, North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 8671 Twana Dr., Garden Grove, Calif.

DORMAN, BERNHARDT L., (f) Manager, Test & Field Service Division, Aerojet-General Corporation, 6352 Irwindale Ave., Azusa, Calif. Home: 2161 Crescent Dr., Altadena, Calif.

DORMAN, BURTON P., (s) University of California, 114 Cunningham Hall, Dweight & Hillside, Berkeley 4, Calif. Home: 2161 Crescent Dr., Altadena, Calif.

DORMAN, FRANK D., (s) University of Minnesota, 411 Walnut S.E., Minneapolis 14, Minn. Home: Eagle Bend, Minn.

DORRANCE, WILLIAM H., (m) Assistant to the Director of Scientific Research, General Offices, Convair, A Division of General Dynamics, San Diego 12, Calif. Home: 6526 Judy Lee Pl., San Diego 15, Calif.

DORRIS, HOMER L., (a) Designer "A", Mechanical Engng., ERCO, Division, ACF Industries Inc., Riverdale, Md., Box 209, Hyattsville, Md. Home: 3200—76th Ave., Hyattsville, Md.

DORS, JOSEPH C., (a) Devel. Engr., Thermodynamics Dept., McDonnell Aircraft Corp., Lampert Field, St. Louis, Mo. Home: 303 Roberta Ave., Ferguson, Mo.

DOSSINGER, DONALD A., (m) Engr. Draftsman, Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 135 Montana, Santa Monica, Calif.

DOTZLER, HERBERT C., Airman 2nd Class, U. S. Air Force, Air Research & Development Command, 4926th Testron (Sampling), Box 10, Kirtland AFB, Albuquerque, N. Mex. Home: Aitkin, Minn.

DOUGHERTY, JOSEPH L., (m) Home: P.O. Box 24, Alamogordo, N. M.
DOUGLAS, DAVID G., (m) Research Engr., North American Aviation, Inc., Slauson & Malt, E. Los Angeles, Calif. Home: 6649 Sepulveda Blvd., Van Nuys, Calif.
DOUGLAS, HOWARD W., (m) Aeronautical Research Scientist, National Advisory Comm. for Aero., 21000 Brookpark Rd., Cleveland 11, O. Home: 645 Grayton Rd., Berea, O.
DOWELL, MILLARD F., (m) Fluid Dynamics Engr., Aircraft Gas Turb. Development Dept., General Electric Co., Evendale Plant, Cincinnati 15, O. Home: 525 Reilly Rd., Wyoming 15, O.
DOWJAT, RICHARD E., (a) Engr., Raymond Eng. Lab. Inc., Smith St., Middletown, Conn. Home: Shelly St., Cromwell, Conn.
DOWLING, ROBERT C., (m) Captain, USAF, 7235th Support Sq. (WP), APO 231, New York, N. Y. Home: Rt. 1, Box 1087A, Miami 44, Fla.
DOWNES, LLOYD C., (m) Hd. Res. Dept., Hoffman Labs., Inc., 3761 S. Hill St., Los Angeles 7, Calif. Home: 5103 Chesley Ave., Los Angeles 43, Calif.
DOWNS, ROBERT R., (m) Engr., Design Div., Engng. Dept., E. I. duPont de Nemours and Co., Inc, Louviers Bldg., Wilmington, Del. Home: 121 Pine Hill Rd., Feasterville, Pa.
DOYLE, HARRY B., (a) Assist. Account Executive, Doyle, Kitchen & McCormick, 380 Madison Ave., N. Y. 17, N. Y. Home: 2 Terrace Circle, Apt. 22-E, Great Neck, L. I., N. Y.
DOYLE, WARREN, (a) Design Group Leader, Daniel Mann Johnson & Mendenhall, 4201 Sunset Blvd., Los Angeles, Calif. Home: 146 N. San Gabriel Ave., Azusa, Calif.
DOYLE, WILLIAM L., (m) Director, High Temp. & Rocket Labs, Research Inst. of Temple Univ., 4150 Henry Ave., Phila. 44, Pa. Home: 400 E. Lancaster Ave., Wayne, Pa.
DRAKE, JOHN A., (m) Director, Long Range Planning & Research Division, Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 3610 Valley Meadow Rd., Sherman Oaks, Calif.
DRAPALIK, GEORGE C., (s) Home: 2514—29th St., Santa Monica, Calif.
DREBINGER, JOHN W., (m) Member, Technical Staff, Hughes Aircraft Co., Culver City, Calif. Home: 21645 Dumetz Rd., Woodland Hills, Calif.
DRECHSEL, CHARLES N., (s) College of Engng., New York University, University Heights, Bronx 53, N. Y. Home: 60-28—60 Dr., Maspeth 78, N. Y.
DREFS, HERBERT W., (a) Instrumentation Tech., Aerojet-General Corp., P. O. Box 1168, Sacramento, Calif. Home: 2812 Berkshire Way, Sacramento 21, Calif.
DREXEL, CHARLES F., (m) Proj. Engr., Missile Accessories AiResearch Mfg. Co. — A Division of The Garrett Corp., 9851 Sepulveda Blvd., Los Angeles 45, Calif. Home: 2548 Via Rivera, Palos Verdes Estates, Calif.
DREXELIUS, VICTOR W., (m) Industrial Cartridge Development Supervisor, Winchester-Western Division, Olin Mathieson Chemical Corporation, East Alton, Ill. Home: #3 Washington Pl., Edwardsville, Ill.
DRISKEL, DON W., Partner, Engineering, Haskel Engng. Associates, 1236 So. Central, Glendale 4, Calif. Home: 4105 Hampstead Rd., Flintridge, Calif.
DRURY, JIM C., (m) Res. Engr., Guided Missile Div.—Power Plant Staff Unit, Boeing Airplane Co., Plant 2, Seattle, Wash. Home: Route 1, Clinton, Wash.
DRYNAN, RONALD D., (s) Purdue University, West Lafayette, Ind. Home: 9615 S. Vanderpoel Ave., Chicago 43, Ill.
DUANE, RAYMOND R., (m) Assist. Proj. Engr., Bell Aircraft Corp., Rocket Dept., P. O. Box 1, Buffalo 5, N Y. Home: Kirkwood Dr., Grand Island, N. Y.
DUBIN, JACK, (m) Group Engr., Armaments & Ordnance, Glenn L. Martin Co., Baltimore 3, Md. Home: 5521 Belleville Ave., Baltimore 7, Md.
DUCHEK, BURTON J., (a) Assist. Engr., Engineering Evaluation, Bendix Aviation Corp., 400 S. Beiger St., Mishawaka, Ind.
DUDECK, ALVIN PAUL, (s) Body Engr., Body Div., Chrysler Corporation, 12800 Oakland, Highland Park, Mich. Home: 35427 Grand River, Farmington, Mich.
DUDLEY, B. W., (m) Assist. Gen. Mgr., Curtiss Wright Corp., Prop. Div., Caldwell, N. J. Home: Green Village, N. J.
DUERR, THOMAS H., (m) Rocket Des. Engr., Rocket Development Division, Rocket Development Laboratory, Redstone Arsenal, Huntsville, Ala. Home: 313 E. Williams St., Huntsville, Ala.
DUFF, RICHARD A., (m) Consultant, Operations Research & Synthetics, Management Consultant Services, General Electric Co., 570 Lexington Ave., New York, N. Y. Home: 4 Boulder Rd., Rye, N. Y.
DUKEMINIER, JOHNNY W., (s) Central State College, Thatcher Hall, Edmond, Okla.
DUMONT, ALLEN B., (m) Chairman of the Board, Allen B. DuMont Laboratories, Inc., Los Angeles, Calif.
DUNATOV, JOSEPH J., Instrumentation Technician, Engineering Dept. Convair, A Division of General Dynamics Corp., 3165 Pacific Hwy., San Diego 17, Calif. Home 3533 Jemez Dr., San Diego 17, Calif.
DUNCAN, PHILIP L., (m) Product Planning Specialist, Specialty Control Dept., General Electric Co., Waynesboro, Va. Home: 321 King Ave., Waynesboro, Va.
DUNHAM, ROBERT, (s) Home: 3147 Roosevelt, Dearborn, Mich.
DUNKELBERGER, WILLIAM R., (s) Indiana Tech. College, 215 E. Washington Blvd., Ft. Wayne, Ind.
DUNKLE, THEODORE E., (s) USAF, 815th Squadron, U. S. Air Force, Home: 639 S. Lafayette, Neosho, Mo.
DUNLAP, D. E., (m) Chief Engr., Douglas Aircraft Co., Inc., 2000 N. Memorial Dr., Tulsa, Okla. Home: 3723 S Delaware Pl., Tulsa, Okla.
DUNN, BENJAMIN, (m) President, B. Dunn & Co., 51 Wilbur Dr., Newington 11, Conn.
DUNN, LOUIS G., (f) Vice President and Director, Guided Missile Research Division, The Ramo-Wooldridge Corporation, 5760 Arbor Vitae St., Los Angeles 45, Calif. Home: 905 Napoli Dr., Pacific Palisades, Calif.
DUNNEBIER, CONRAD E., (s) Univ. of Conn., 113 Hartford Hall, Storrs, Conn. Home: 177 Buckingham St., Meriden, Conn.
DURANT, FREDERICK C., III, (m) Staff Member, Arthur D. Little, Inc., 30 Memorial Drive, Cambridge 42, Mass. Home: 24 Percy Rd., Lexington, Mass.
DURANTE, BENJAMIN M., (s) Academy of Aeronautics, LaGuardia Airport. Home: 501 E. 11th St., N. Y. C.
DURHAM, CHARLES EASTMAN, (m) Chief Admin. Engr., Armament Department, White-Rodgers Electric Co., 4407 Cook Ave., St. Louis 13, Mo. Home: 51 North Elm Ave., Webster Groves 19, Mo.
DURNING, WILLIAM P., (a) Sales Promotion Mgr., Jerry Achtenhagen & Sons, Inc., 820 W. Ash St., San Diego, Calif. Home: 8748 Garolle Circle, La Mesa, Calif.
DURYEA, JOHN B., (m) Development Engr., General Electric Co., Guided Missiles Dept., 2900 Campbell Ave., Schenectady, N. Y. Home: Box 172, Burnt Hills, N. Y.
DUTTON, JAMES M., (a) Application Engr., Aircraft Products Sales, Vickers Inc., 1400 Oakman Blvd., Detroit 32, Mich. Home: 18686 Gilchrist, Detroit 35, Mich.
DUTTON, ROBERT G., (a) Process Engr. B., Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 1736 Franklin St., Santa Monica, Calif.
DUTTON, ROY A., (m) Staff Ass't. to Exec. V. P., Garrett Corp., 9851 Sepulveda Blvd., Los Angeles 45, Calif. Home: 463—24th St., Santa Monica, Calif.
DRAGANOV, SAMUEL M., (a) Alcoa Research Fellow in Physical Chem., Dept. of Chemistry, University of Oregon, Eugene, Ore., Home: 133 Rio Glen Dr., Eugene, Ore.
DWORAK, RICHARD G., (s) Bemis 103, E.C., MIT, Cambridge 39, Mass. Home: 131 Westfall Ave., Tonawanda, N. Y.
DYNES DONALD L., (m) Chief, Test Operations Branch, Exp't'l. Rocket Engine Test Station, U. S. Air Force, Edwards A.F.B., Calif. Home: 44439 Lowtree Ave., Lancaster, Calif.

E

EARLE, ALBERT P., (a) Asst. Prof., University of Minnesota, Dept. of Chem. Engng., Minneapolis, Minn. Home: 613 Oak St., S.E., Minneapolis 14, Minn
EAST, GEORGE B., (s) Lawrence Inst. of Technology, 15100 Woodward, Highland Park 3, Mich. Home: 14541 Whitcomb, Detroit 27, Mich.
EASTMAN, ROBERT J., (a) Prod. Development, Tech. Rep., Allied Chemical & Dye Corp., Nitrogen Div., 40 Rector St., N. Y. 6, N. Y. Home: 316 West 75th St., New York 23, N. Y.
EASTON, ROGER L., (a) Electronic Scientist, Project Vanguard, Naval Research Lab., 4th & Chesapeake, Washington 25, D. C. Home: 6566 Oxon Hill Rd., Washington 21, D. C.
EATON, DAVID C., (m) Works Mgr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: Pines Lake Dr. W., Paterson, N. J.
EBER, GERHARD R., (m) Tech. Dir., Holloman Air Development Center, Holloman A.F.B., N. M. Home: 1904 Florida Ave, Alamogordo, N. M.
ECKENROTH, HOWARD F., (m) Electro-Mech. Engr., Electro-Mech. Dept., Glenn L. Martin Co., Baltimore 3, Md. Home: 8635 Richmond Ave, Baltimore 14, Md.
ECKERT, ERNEST R. G., (m) Prof. of Mech. Engng., Unuiversity of Minnesota, Minneapolis 14, Minn. Home: 60 W. Wentworth Ave., St. Paul 7, Minn.
ECKERT, FAYETTE, (m) Test Man, Aeronautics & Ordnance Div., General Electric Co., Schenectady, N. Y. Home: Stop 17 Anthony Lane, West Albany, N. Y.
ECKERT, JOHN A., (s) Purdue University, W. Lafayette, Ind. Home: 130 Russell St., W. Lafayette, Ind.
ECKSTEIN, ROYAL W., JR., (s) Case Institute of Tech., University Circle, Cleveland 6, O. Home: 1623 E. 117th St., Cleveland 6, O.
EDELMAN, BENNETT H., (m) Chief Resident Engr., Chicago Midway Laboratories, Eglin Air Force Base, Fla. Home: 53 N. Bay Dr., Ft. Walton Beach, Fla.
EDDINGTON, ROBERT B., (a) USAF, 8th Ftr. Bmr. Gp., APO 240, San Francisco, Calif. Home: 85 W. 4th St., Springville, Utah.

EDLER, HENRY G., (m) President & General Mgr., National Rocket Corp., 7929 Seville Ave., Huntington Park, Calif. Home: 11300 Hannum Ave., Culver City, Calif.

EDSE, RUDOLPH, (m) Associate Professor (Supervisor of Rocket Lab.) Ohio State University, Columbus 10, Ohio. Home: 2090 Iuka Ave., Columbus 1, O.

EDWARDS, SHELTON H., (s) Test Engr., Pratt & Whitney Aircraft Corp., East Hartford 8, Conn. Home: 86 Elihu St., Hamden 14, Conn.

EGGERS, ALFRED J., (m) Chief, 10-by-14 inch Supersonic Wind Tunnel Branch, High Speed Research Division, NACA—Ames Aero. Lab., Moffett Field, Calif. Home: 1098 S. Springer Rd., Los Altos, Calif.

EGLI, ADOLF, (m) Mgr., Basic Engng. Dept., Scientific Laboratory, Engng. Staff, Ford Motor Company, P. O. Box 2053, Dearborn, Mich. Home: 23542 Military Rd., Dearborn Township, Mich.

EGUIAZU, MIGUEL D., (a) Engr., Fabrica De Locomotoras A Vapor, Calle 3y, 26 Eva Peron, Argentina. Home: Calle Entrerios 1543 Rosario, Argentina.

EHRESMAN, CHARLES M., (a) Sr. Test Engr., Test and Field Service Division, Aerojet-General Corp., Irwindale Ave., Azusa, Calif. Home: 1211 Indian Summer, Puente, Calif.

EHRICKE, KRAFFT A., (m) Group Engr., Pre. Design & Systems Analysis, Model 7 Division, Convair, A Division of General Dynamics, 3165 Pacific Highway, San Diego 3, Calf. Home: 4615 Kensington Dr., San Diego 16, Calif.

EHRSAM, GEORGE W., (m) Sales Manager, Manufacturing Div., Warren Brothers Roads Co., 32 Potter St., Cambridge, Mass. Home: 95 Monroe Rd., Quincy, Mass.

EICHSTAEDT, HERBERT A., (a) LOX Sales Engr., Cryogenic Division, Ronan & Kunzl, Inc., 502 So. Kalamazoo Ave., Marshall, Mich. Home: 308 East Drive, Marshall, Mich.

EIDE, RALPH M., (m) Product Engr., Reaction Motors, Inc., 1373 Westwood Blvd., Los Angeles, Calif.

EILENBERG, STANTON L., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 21112 Ave., San Luis, Woodland Hills, Calif.

EINBINDER, LOUIS WM., (a) Electronics Engr., General, WADC, WPAFB, DOL Div., Wright Patterson AFB, O. Home: 1925 Portman Ave., Cincinnati 37, O.

ELDER, JOHN KENDALL, (m) Proj. Chemist, Res. and Devel. Div., Grand Central Rocket Co., P. O. Box 111, Redlands, Calif. Home: 1309 Campus Ave., Redlands, Calif.

ELKO, EDWARD R., (m) Head, Thrust Chamber Dept., Liquid Eng. Div., Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 1135 Coronet Ave., Pasadena 8, Calif.

ELLENBERG, KARL H., (m) Mechanical Engng., Peerless Instrument Co., 90-15 Corona Ave., Elmhurst 73, N. Y. Home: 51-75 Manila St., Elmhurst 73, N. Y.

ELLION, M. EDMUND, (m) Consultant, Weapon Systems, Ramo-Wooldridge & Hughes Aircraft, Los Angeles. Home: 2831 Larkfield, Arcadia, Calif.

ELLIOTT, DAVID G., (a) Rocket Laboratory, Purdue University, West Lafayette, Ind. Home: 133 Sylvia St., West Lafayette, Ind.

ELLIOTT, JAMES L., (m) Assistant to General Mgr., Leach Corporation, 5915 Avalon Blvd., Los Angeles 3, Calif. Home: 13 Eastfield Dr., Rolling Hills, Calif.

ELLIOTT, JAMES P., (a) California Institute of Technology, Pasadena, Calif. Home: 401 Roosevelt Ave., Montebello, Calif.

ELLIS, AL, (m) Prod. Electronic Engr., Engng., Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 5498 Selmarine Dr., Culver City, Calif.

ELLIS, BERNARD, Head of Propulsion Dept., New Design Division, Lockheed Missiles System Div., Saticoy & Woodley, Van Nuys, Calif. Home: 12728 Oxnard St., North Hollywood, Calif.

ELLIS, CHARLES L., (m) Deputy Division Mgr.-Technical, Pan American World Airways, Inc., P. O. Box 308, Patrick Air Force Base, Fla. Home: Rte. 1, Box 512, Melbourne, Fla.

ELLIS, EMORY L., (m) Dir. Tech. Planning, Res. & Dev. Labs., Rheem Mfg. Co., 9236 E. Hall Rd., Downey, Calif. Home: 7924 Lyndora, Downey, Calif.

ELLIS, DEAN J., (m) Design Specialist, Dept. 7, Convair-Div. of General Dynamics Corp., Pacific Highway, San Diego, Calif. Home: Apt. 1, 3424 Waco St., San Diego 17, Calif.

ELLIS, HERBERT B., (m) Technical Specialist, Aerojet-General Corp., Azusa, Calif. Home: 937 Inverness Dr., Pasadena 3, Calif.

ELLIS, ROBERT A., JR., (m) Prof. of Physics, Physics Dept., Tennessee A and I State University, Nashville 8, Tenn. Home: 995 39th Ave. N, Nashville, Tenn.

ELLMORE, LEWIS, (s) Tech. Staff, Hughes Aircraft Co., Culver City, Calif. Home: 7031 W. 94th St., Los Angeles, Calif.

ELLROD, HAROLD D., (m) Asst. Sales Mgr., Air Arm Div., Westinghouse Electric Corp., Friendship Int'l. Airport, Baltimore, Md. Home: 1625 Manning Rd., Harondale, Md.

ELLSWORTH, CHAS. R., (m) Ram-Jet Engr., Ram-Jet, Turbine & Hydraulics Gr., Bendix Products Div., 400 S. Beiger St., Mishawaka, Ind. Home: 932 W. Colfox Ave., S. Bend, Ind.

ELNAN, ODIN R. S., (m) Instructor, Aero. Engng., Univ. of Cincinnati, Cincinnati 21, O. Home: 1315 Considine Ave., Cincinnati 4, O.

ELSE, WILLIS I., (s) Instructor, U. S. Army, B Btry., 1st GM Bn (SAM), Ft. Bliss, Tex. Home: 903 Eighth St., Fairbury, Nebr.

ELVERUM, GERARD W. JR., (m) Research Engr., JPL, Calif. Inst. of Tech., 4800 Oakgrove Dr., Pasadena, Calif. Home: 2216 Wesleygrove, Duarte, Calif.

ELWARD, JOSEPH F., (s) Assistant Engr., Johns Hopkins Univ. A.P.L., Silver Spring, Md. Home: 1507 East-West Hwy., Silver Spring, Md.

ELWELL, HARWOOD C., (m) Test Engr., Structures Test, Northrop Aircraft, Inc., Hawthorne, Calif. Home: 541½ Heliotrope Dr., Los Angeles 4, Calif.

EMERICK, BRUCE D., (m) Proof Director, Rocket Br., I & AW Div., D & PS, Ordnance Corps, Aberdeen Proving Ground, Md. Home: Box 677, RD. #2, Joppa, Md.

EMERY, EARNEST M., (m) Development Engr., North American Aviation, Inc., Rocket Eng. Div., Malt & Slauson Sts., Los Angeles, Calif. Home: 10854 Monogram Ave., Granada Hills, Calif.

EMMONS, GEORGE S., (m) Supervisor, X-405 Engng., Rocket Engine Section—Aircraft Gas Turbine Development Department, General Electric Co., Bldg. 600, Cincinnati, O. Home: 168 Ireland, Green Hills, O.

EMRICK, WILLIAM H., (m) Proj. Engr., Engng. Dept., Reaction Motors Inc., Ford Rd., Denville, N. J. Home: 30 Birchwood Rd., Denville, N. J.

ENDERS, JOHN H., (m) United States Air Force, Box 122, 10th Strat. Recon. Sqdn. Lockbourne AFB, Columbus 17, O. Home: RFD #2, Sidney, O.

ENGEL, ROLF, (m) Tech. Director, Engr. in Chief, Compagnie des Engins a Reaction pour Vol Accelere, CERVA Div., Heliopolis Ile Caire, Almaza, Egypt. Home: 23, Rue Bonaparte, Heliopolis Ile Caire, Egypt.

ENGLAND, ARTHUR O. (a) Supervisor, Personnel Development, Chrysler Corp., Missile Br., Van Dyke & 16 Mile Rd., Box 2628, Detroit 31, Mich. Home: 5115 Chatsworth, Grosse Pointe 30, Mich.

ENGLAND, KENNETH WILLIAM, (a) Royal Army Ordnance Corps., 88 Granville Rd., Hillingdon, Middlesex, England.

ENGLISH, WILLIAM J., (m) Missile Technician, Bell Aircraft Corp., Holloman AFB, N. M. Home: P. O. Box 1224, Alamogordo, N. M.

ENYART, WILLIAM R., (m) President, Simmonds Aerocessories, Inc., 105 White Plains Rd., Tarrytown, N. Y. Home: Deer Park, Woodside Rd., Greenwich, Conn.

ERBS, JOSEPH E., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 2332 Lillyvale Ave., Los Angeles 32, Calif.

ERDMAN, FRANK H., (m) Vice President, Experiment Incorporated, Richmond 2, Va. Home: 7909 Dogwood Rd., Richmond 26, Va.

ERICKSON, ROBERT P., (m) Proj. Engr., Missile Operations, Chrysler Corp., P.O. Box 2628, Detroit 31, Mich. Home: 2712 Windemere Rd., Birmingham, Mich.

ERIKSON, TED ALLEN, (m) Ass't. Chem. Engr., Armour Research Foundation, Chemistry Div., 15 W. 35th St., Chicago 21, Ill. Home: 4749 W. 89th Pl., Oaklawn 9, Ill.

ERVIN, AUGUSTUS L., JR., (m) Sales Engr., Fairchild Eng. Div., Farmingdale, N. Y. Home: 156 Fox Lane, Northport, N. Y.

ESCHER PETER H., (m) Electrical Engr., Aerophysics Development Corp., 15304 Sunset Blvd., Pacific Palisades, Calif. Home: 27 Latimer Rd., Santa Monica, Calif.

ESCHER, WILLIAM J. D., (m) Engng. Aide, Vehicles Branch, Proj. Vanguard, Naval Research Laboratory, Washington 25, D. C. Home: 2026 Third St., N.E. Washington 2, D. C.

ESENWEIN, AUGUST C., (m) Vice President-Mgr., Ft. Worth Division, Convair—A Division of General Dynamics Corporation, Box 748, Ft. Worth 1, Tex. Home: 505 Rivercrest Dr., Ft. Worth 7, Tex.

ESPY, MELVIN P., (m) Home: 3030 San Juan Dr., Fullerton, Calif.

ESSLINGER, WILLIAM H., JR., (m) Chem. Engr., Industrial Division, Redstone Arsenal, Huntsville, Ala. Home: 28 Van Buren, Huntsville, Ala.

ETCHELLS, JOAH B., (m) 1st Lt., Electronic Warfare Div., WSSCA, White Sands Proving Ground, N. M. Home: 1720 Princess Jeanne Dr., Las Cruces, N. M.

ETHERINGTON, HAROLD, (m) Vice President, Nuclear Energy Products Division, ACF Industries, Incorporated, 30 Church St., New York 8, N. Y. Home: 43 Browning Rd., Short Hills, N. J.

EUSANIO, EMIL N., (m) Design Engr., Rocket Dept., Bell Aircraft Corp., P. O. Box One, Buffalo 5, N. Y. Home: 200 Rosemont, Kenmore 17, N. Y.

EVANS, MARJORIE W., (m) Sr. Physicist, Stanford Research Institute, Menlo Park, Calif. Home: 14511 DeBell Dr., Los Altos, Calif.

EVANS, PAUL I., (m) Project Engr., Ord. Research & Development, Harvey Machine Co., Inc., 19200 S. Western Ave., Torrance, Calif. Home: 425 E. 61st, Long Beach 5, Calif.

EVANS, THOMAS P., (m) Deputy Director, Research & Development, Engng., American Machine & Foundry Co., 261 Madison Ave., New York 16, N. Y. Home: 11 Bruce Pl., Greenwich, Conn.

EVERETT, CORNELIUS J., (m) Staff Member, Los Alamos Scientific Lab., Theoretical Div., Los Alamos, N. M. Home: 1334 - 43rd St., Los Alamos, N. M.

EVERHARD, FREDRIC U., JR., (m) Electronics Engr., RCA Service Co., Inc. Gov. Div., Glouster, N. J. Home: 207 Fairway Dr., Huntsville, Ala.

EWELL, JACK, (s) Georgia Inst. of Technology, Atlanta, Ga., Home: 404 E. 38th St., Odessa, Tex.

EWEN, DOUGLAS G., (m) LCDR-USN, Aviation Technical Liaison Officer, Scientific Dept., Office of Naval Research, 1030 E. Green St., Pasadena 1, Calif. Home: 1155 Rexford Ave., Pasadena 8, Calif.

EXSELSEN, CARL H., (m) Tech. Eng. (Design) General Electric Co., Jet Eng. Dept., Evendale, O. Home: 4523 Erie Ave., Cincinnati 27, O.

EZELL, WILLIAM F., Research Engineering Specialist, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 5271 Woodlake Ave., Woodland Hills, Calif.

F

FACE, WILLIAM H., (m) Contracts Manager, Swedlow Plastics Co., 6986 Bandini Blvd., Los Angeles 22, Calif. Home: 2207 Homet Rd., San Marino, Calif.

FAEHNRICH, JOHN, (m) Home: 560 Mentor Ave., Painesville, O.

FAGAN, JAMES J., (m) Assist. Director Guided Missiles, Res. Devel-Dir., Ordnance Missile Laboratories, Redstone Arsenal, Huntsville, Ala. Home: 700 Hermitage St., Huntsville, Ala.

FAHEY, PHILIP F., JR., (m) Chief, Test Eng. Br., Rocket Engine Test Lab., AFFTC—RETL, Edwards AFB, Edwards, Calif. Home: Star Rt. #2, Palmdale, Calif.

FAHERTY, MARTIN P., (s) Brooklyn Polytechnic Institute, 85 Livingston St., B'klyn 1, N. Y. Home: 505 W. 162nd St., New York 32, N. Y.

FAITANI, JOSEPH J., (m) Test Engr., Experimental Test Dept., Pratt & Whitney Aircraft, 400 Main St., East Hartford, Conn. Home: 5 Lewis Ave., Westerly, R. I.

FALLON, CLIFFORD T., (m) Sales Engineer, Linde Air Products Co., 2770 Leonis Blvd., Los Angeles 58, Calif. Home: 3669 Homeway Dr., Los Angeles, Calif.

FARBER, MILTON, (m) Engr., Head of Propellants Section, Study and Applied Research Dept., Aerojet-Gen. Corp., Azusa, Calif. Home: 2899 Mt. Curve, Altadena, Calif.

FARIS, JULIUS PORTER JR., Lt. Col., Hq., USAF, AFOIN 2C5, Washington, D. C. Home: 300 South Ivy, Arlington 4, Va.

FARNINGHAM, GILBERT D., (s) Orange County Community College, Middletown, N. Y. Home: Tuxedo Park, N. Y.

FARNSWORTH, WALTER B., (m) Mgr., Linde Air Products Co., 686 Frelinghuysen Ave., Newark, N. J. Home: 20 Ramapo Rd., Cranford, N. J.

FAUSTER, JOSEPH F., (s) Flight Engineer, USAF, Clinton County AFB, Wilmington, O. Home: 513 Third Ave., West Bend, Wisc.

FAY, JAMES W., (m) Treasurer, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: Wingate Rd., RR #2, Parsippany, N. J.

FEARN, RALPH F., (m) Propulsion Specialist, Technical Staff, White Sands Proving Ground, N. M. Home: 230 W. Fleming, Las Cruces, New Mex.

FEHR, THOMAS W., (m) Assist. Engr., Test and Field Service Div., Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 314 So. Cedar Dr., Covina, Calif.

FEHRMAN, ALVIN L., (m) Captain USAF, Mechanical Engng. Institute of Technology USAF, Wright Patterson AFB, O. Home: 3446 Richfield Dr., Dayton 10, O.

FEICHT, EDWARD R., (m) Major, USAF, Air Research & Development Command, Baltimore, Md. Home: 1239 Gleneagle Rd., Baltimore 12, Md.

FEILER, CHARLES E., (m) Aeronautical Research Scientist, NACA-Lewis Flight Prop. Labs., 21000 Brookpark, Cleveland 11, O. Home: 14317 Bayes Ave., Lakewood 7, O.

FEIRSON, SANFORD D., (s) University of Wichita. Home: 1157 N. Pershing St., Wichita 14, Kans.

FELD, DAVID, (m) Acting Group Leader Rocket Install., Rocket Section, Bell Aircraft Corp., Buffalo, N. Y. Home: 379 Faraday Rd., Kenmore 23, N. Y.

FELDMAN, SAUL, (s) Advanced Development Engr., Research Labs., AVCO Advanced Development Division, 2385 Revere Beach Pky., Everett 49, Mass. Home: 98 Chelsea St., Everett 49, Mass.

FELDMAN, K. F., (m) Project Engineer, Aerophysics Development Corp., P. O. Box 949, Santa Monica, Calif.

FELDSCHER, JOHN C., (m) Section Head, Rocket Prop. Engr., Aerophysics Div., Goodyear Aircraft Corp., 1210 Massillon Rd., Akron 15, O. Home: 715 W. Maple St., N. Canton, O.

FELLIN, CORNELIUS S., (a) Home: 43-60 195th St., Flushing 58, N. Y.

FELLION, GLENN R., (m) Sr. Proj. Eng. Guided Missile Div., Firestone Tire & Rubber, 2525 Firestone, Los Angeles, Calif. Home: 6833 N. Muscatel Ave., San Gabriel, Calif.

FELT, N. ELLIOTT, JR., (m) Operations Manager, Operations, The Martin Co., Mail #534, Baltimore 3, Md. Home: 12 Dublin Dr., Towson 4, Md.

FELTS, ROBERT, (m) Project Engineer, Chrysler Corporation, Missile Branch, P. O. Box 2628, Detroit 31, Mich. Home: 5931 Willow, Rt. 5, Pontiac, Mich.

FELZENBERG, ALBERT, (m) Electronic Engr., Tech. Operations, Pan American World Airways, OMU Box 308, PAFB, Fla. Home: 310 Poinsettia Dr., Eau Gallie, Fla.

FENNINGER, CHARLES R., (m) Consolidated Western Steel Div., U. S. Steel Corp., 5700 South Eastern Ave., P.O. Box 2015, Terminal Annex, Los Angeles, Calif.

FENSKE, RONALD G., (s) University of Wisconsin, Madison, Wis. Home: 3941 N. 53 St., Milwaukee 16, Wis.

FENSKE, RUSSELL W., (m) Northwestern University, Room 404, Abbott Hall, 710 Lake Shore Dr., Chicago, Ill. Home: 929 North Astor St., Milwaukee 2, Wis.

FENTON, STUART J., (m) Prin. Aerodynamicist, Advanced Systems Dept., Bulova Research & Development Labs., 62-10 Woodside, Woodside 77, N. Y. Home: 1489 First Ave., New York 21, N. Y.

FENTON, WAYNE H., (m) Devel. Engr., Liquid Rocket Plant, Aerojet-General Corporation, Sacramento, Calif. Home: 2901 Rubicon Way, Sacramento 21, Calif.

FERENCE, MICHAEL, JR., (m) Assoc. Director, Scientific Laboratory, Engng. Staff, Ford Motor Company, 21500 Oakwood Blvd., Dearborn, Mich. Home: 635 Meadowline Rd., Dearborn, Mich.

FERGUSON, HARRY R., (m) Vice President, Thiokol Chemical Corporation, 780 N. Clinton Ave., Trenton 7, N. Y. Home: Crown Terrace, Morrisville, Pa.

FERGUSON, WILLIAM A., (m) Computer Instructor, Signal Corps., U. S. Army, 9615 TU Redstone Arsenal, Huntsville, Ala. Home: P. O. Box 742, Tallahasse, Fla.

FERRIS, DELACY F., (m) Chief of Prelim. Design, Engng. & Res. Div., Reaction Motors, Inc., Denville, N. J. Home: Valley View Rd., Morristown, N. J.

FERULLO, HARRY A., (m) Proj. Engr., Rocket Engng. Dept., Bell Aircraft Corporation, P. O. Box One, Buffalo 5, N. Y. Home: 88 Conant Dr., Kenmore 23, N. Y.

FETSKE, ERNEST F., (a) President, Ernest F. Fetske & Co., Essex, Conn. Home: Essex, Conn.

FEUER, HENRY, (m) Assoc. Prof., Chemistry, Purdue University, Lafayette, Ind. Home: 230½ Littleton St., W. Lafayette, Ind.

FIALA, WILLIAM A., (m) Washington Representative, General Tire & Rubber Co., 1625 Eye St., N.W., Washington, D. C. Home: 4840 Wellington Dr., Chevy Chase, Md.

FICKES, WILLIAM H, (m) Electronics Engr., Chief, Systems Evaluation, Frequency Coordination Dir., White Sands Signal Corps Agency, White Sands Proving Ground, N. M. Home: 1417 Boston Dr., Las Cruces, N. M.

FICKLEN, JOSEPH B., III, (m) Consultant, North American Aviation, Inc., Downey, Calif. Home: 1848 E. Mountain St., Pasadena 7, Calif.

FIGUERAS, RICHARD, (s) Parks College, E. St. Louis, Ill., Home: 3443 W. Beach, Chicago, Ill.

FIFE, CHARLES E., (m) Contracting Engr., Aircraft Missile Div., Consolidated Western Steel Div., P.O. Box 2015, Terminal Annex, Los Angeles, Calif. Home: 8950 S. Haas Ave., Los Angeles 47, Calif.

FILES, F. M., (m) Mgr., Manufacturing Branch, Rocket Fuels Division, Phillips Petroleum Company, McGregor, Tex. Home: 4005 Morrow, Waco, Tex.

FINE, ALECK, (m) General Engineer, Naval Ordnance Laboratory, Corona, Calif. Home: 9571 Carver Court, Arlington, Calif.

FINGER, ELMER I., (m) Test Supervisor, Rocket Engine, AGT, General Elec. Co., Malta Test Sta., Ballston Spa, N. Y. Home: 108—2nd St., Scotia 2, N. Y.

FINGER, JOHN C., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Canoga Park, Calif. Home: 19538 Blythe St., Reseda, Calif.

FINGERET, HAROLD, (s) Academy of Aeronautics, LaGuardia Airport, New York, N. Y. Home: 1111 Ocean Ave., Brooklyn, N. Y.

FINK, FRANK W., (m) Chief Engr., Convair, A Div. of General Dynamics Corp., P.O. Box 1950, San Diego 12, Calif. Home: 3211 Ibsen St., San Diego 6, Calif.

FINLEY, WILLIAM L., (m) Associate Research Engineer-A, Mechanical Equipment Unit, Boeing Airplane Co., Plant Two, Seattle 14, Wash. Home: 19317 Meridian, Seattle 33, Wash.

FINNEY, ALBERT T., (m) Technical Staff, Systems Test Div., Ramo-Wooldridge Corp., 8860 Bellanca, Los Angeles, Calif. Home: 823 Lincoln, Apt. 7, Santa Monica, Calif.

FINSTON, MORTON, (m) Assistant Professor, Aeronautical Engineering, Massachusetts Institute of Technology, Cambridge 39, Mass.

FIOCK, ERNEST F., (m) Director, Tech. Devel. Branch, Rocket Fuels Division, Phillips Petroleum Co., P. O. Box 548, McGregor, Tex. Home: 103 Newman Apt., Waco, Tex.

FIORIO, FRANCO E., (m) Lt. Colonel, Italian Air Force. Home: Via Torlonia, 12, Rome, Italy

FISCHER, ELLIOTT F., (m) Development Engineer, Aerojet-General Corp., Liquid Engine Div., Azusa, Calif. Home: 5 Bella Vista Terrace, Sierra Madre, Calif.

FISCHER, ROGER W., (m) Project Administrator, Eng. Div., American Bosch Arma, Garden City, L. I., N. Y. Home: 95 Cherry St., Farmingdale, L. I., N. Y.

FISHER, CHARLES F., (s) Home: 1623 Freeman St., Ft. Wayne, Ind.

FISHER, JAMES H., (m) Assist. Prof., Electrical Engng., University of Washington, Seattle 5, Wash. Home: 1523—11th West, Seattle 99, Wash.

FISHER, MARSHALL H., (m) Librarian, James Forrestal Research Center, Princeton University, Princeton, N. J.

FISHMAN, BERNARD, (m) Project Engineer, Simmonds Aerocessories, Inc., 105 White Plains Rd., Tarrytown, N. Y. Home: 20 Stuyvesant Oval, New York 9, N. Y.

FITCH, HUBERT, Purdue University, W. Lafayette, Ind. Home: 540 N. Arnolda, Indianapolis, Ind.

FITTON, CLIFF E., JR., (m) Chief, Design Branch, Rocket Devel. Div., Redstone Arsenal, Redstone Arsenal, Huntsville, Ala. Home: 118 Bibb Rd., Huntsville, Ala.

FITZGERALD, J. EDMUND, (m) Research Manager, Applied Dynamics Group, American Machine & Foundry Co., Mechanics Research Dept., 1104 S. Wabash, Chicago, Ill. Home: 1275 Eastwood Ave., Highland Park, Ill.

FITZGERALD JAMES W., (m) Prod. Projects Engr., Production Projects Department, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 107 Glenbrook Rd., Morris Plains, N. J.

FLACH, DONALD O., (m) Project Engr., Engng. Devel. Lab., Becco Chemical Div., Food Machinery & Chem. Corp., Station B, Buffalo 7, N. Y. Home: 78 Sedgemoor Crt., Williamsville 21, N. Y.

FLAHERTY, WILLIAM J., (m) Technical Staff, Hughes Aircraft Corporation, Guided Missile Division, Culver City, Calif. Home: 4537 Belita Lane, La Canada, Calf.

FLAMM, HENRY F., (m) Engr., General Electric Co., Schenectady, N. Y. Home: 1730 So. Alamo St., Las Cruces, N. M.

FLEMING, FRANK F., (m) Ordnance Design E., Redstone Arsenal, Huntsville, Ala. Home: 1901 Lafayette Rd., Huntsville, Ala.

FLETCHER, JAMES C., (m) Ramo-Wooldridge Corp., 5760 Arbor Vitae, Los Angeles 45, Calif. Home: 4119 Fairway Blvd., Los Angeles 43, Calif.

FLOOD, ARTHUR F., (m) Executive Vice President & Comptroller, Fairchild Engine & Airplane Corp., Box 770, Hagerstown, Md. Home: 510 Gordon Circle, Hagerstown, Md.

FLORIO, FERNAND, (m) Technical Director, Societe d'Etude de la propulsion par Reaction, 37 Rue des Acacias, Paris, France. Home: 1 bis, Rue Jeanne D'Arc, Sevres, S.O. France.

FLORMAN, IRVING S., (m) Propulsion Engineer, Denver Division, The Martin Company, Denver, Colo. Home. 4980 W. Vassar Ave., Denver, Colo.

FOA, JOSEPH V., (m) Professor of Aeronautical Engineering, Rensselaer Polytechnic Institute, Troy, N. Y. Home: 33 Point View, Troy, N. Y.

FOBER, FREDERICK C., (m) Industrial Training Consultant, Fober & Associates, 1149 Cornelia, Chicago 13, Ill.

FOERSTER, WILBERT G., (s) USAF, 2nd Bomb Wing (USAF), 2nd Armament and Electronics, Maint. Sqd., Box 140, Hunter AFB, Savannah, Ga. Home: Rt. #1, Box 199, Elkhart Lake, Wisc.

FOGLE, ELSTON E., (m) Vice President, Industrial Chemicals Division, Carbide and Carbon Chemicals Co., A Div. of Union Carbide and Carbon Corporation, 30 East 42nd St., New York 17, N. Y. Home: 88 Hanson Rd., Darien, Conn.

FOGEL, IRVIN N., (a) Accountant, Financial Accounting Missile Systems Division, Lockheed Aircraft Corporation, Van Nuys, Calif. Home: 7339 Woodman Ave., Van Nuys, Calif.

FOGEL, JERRY, (s) Jr. Designer, Phelps Dodge, Inca Div., New Haven Ave., Ft. Wayne, Ind. Home: 3220 Clinton Ct., Ft. Wayne, Ind.

FOGEL, LAWRENCE J., (a) Research Consultant, Stavid Engineering Inc., 312 Park Ave., Plainfield, N. J. Home: 35-24—78th St., Jackson Heights, N. Y.

FOLEY, JAMES, (m) Major, USAF, Box 449, Acss. Maxwell AFB, Montgomery, Ala. Home: 6419 N. Smedley St., Philadelphia, Pa.

FOLEY, ROBERT A., (s) Brooklyn College. Home: 1352 - 67th St., Brooklyn 19, N. Y.

FOLKERTS, KEITH D., (m) Design Engr., Architect-Engineer Division, Aerojet-General Corp., Azusa, Calif. Home: 1141 Cedarbrook St., W. Covina, Calif.

FOLSOM, RICHARD G., (m) Director, Engineering Research Institute, University of Michigan, 2034 East Engineering Building, Ann Arbor, Mich. Home: 2210 Hill St., Ann Arbor, Mich.

FONS, PHILLIP CORRIGAN, (m) Instrumentation Design Specialist, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: Box 248, Woodland Hills, Calif.

FONTAINE, A. P., (m) Vice President-Engng., Bendix Aviation Corporation, 1104 Fisher Building, Detroit 2, Mich. Home: 1370 W. Lincoln, Birmingham, Mich.

FORBES, FORREST S., (m) Proj. Engr. (Liquid rocket propellants) Fuel & Oil Br. of Power Plant Laboratory, WADC, Wright-Patterson Air Force Base, O. Home: 5260 Cobb Dr., Dayton 3, O.

FORD, FRANK J., (s) Academy of Aeronautics, LaGuardia Airport, Flushing, N. Y. Home: 2538 Hering Ave., New York 69, N. Y.

FORD, JOHN P., (m) Experimental Rocket Engine Test Station, AFFTC, Code FTREC, Edwards A.F.B., Edwards, Calif. Home: 45335 Gasden St., Lancaster, Calif.

FORD, RICHARD W., (m) Sr. Rocket Engine Repairer, Rocket Engine Test Lab., FTRDA, Edwards AFB, Edwards, Calif.

FORE, WALLACE E., (m) Assist. Plant Engr., Los Angeles Division, North American Aviation, 5701 Imperial Highway, Los Angeles, Calif. Home: 5716 Murietta Ave., Van Nuys, Calif.

FORMAN, LOUIS B., (a) Head, Elect. Design Dept., Chrysler Corporation, Engineering Div., Missile Branch, Detroit 31, Mich. Home: 11379 Pennington Dr., Detroit 21, Mich.

FORSLUND, GERALD M., JR., Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 5856 Topeka, Reseda, Calif.

FORSMO, DENNES P., (s) Purdue University, 109 Sylvia St., Lafayette, Ind. Home: 4307 Drexel Ave., Madison, Wisc.

FORTINI, ANTHONY, (m) Aero. Res. Scientist, Rocket Laboratory, NACA, Cleveland Airport, Cleveland, O. Home: 1343 Kenilworth, Lakewood 7, O.

FORTNEY, LLOYD R., (s) New Mexico A & M, State College, N. M. Home: Box 908, State College, N. M.

FORTUNA, ANTHONY F., (a) Assist. Quality Control Mgr., Radioplane Co., Box 392, Holloman AFB, Holloman, N. M. Home: 5418 Marburn Ave., Los Angeles, Calif.

FORTUNE, WILLIAM C., (m) Captain, Head, Air Branch, Office of Naval Research, Washington 25, D. C. Home: 6914 Wilson Lane, Bethesda 14, Md.

FOSS, CLIFTON T., (m) Vice President and General Mgr., Arma Division, American Bosch Arma Corporation, Roosevelt Field, Garden City, N. Y. Home: Pheasant Lane, Greenwich, Conn.

FOSTER, RICHARD BRUCE, (m) Preliminary Design Group Leader, Rocket Dept., Bell Aircraft Corporation, P. O. Box 1, Buffalo 5, N. Y. Home: 280 Getzville Rd., Snyder 21, N. Y.

FOSTER, RICHARD W., (a) Naval Research Laboratory, Washington, D. C. Home: Box 828, Poughkeepsie, N. Y.

FOSTER, THEODORE D., (m) Home: 876 Standish Ave., Westfield, N.J.

FOSTER, VICTOR W., (m) Development Engr., Flight Simulator Div., Erco Division, ACF Industries, Riverdale, Md. Home: Apt. 212, 4114 Davis Pl., N.W., Washington, D. C.

FOX, AUGUSTUS H., (m) Professor of Mathematics, Union College, Schenectady, N. Y. Home: 1125 Oxford Place, Schenectady, N. Y.

FOX, FREDERICK K., (m) Stress Analyst "A", Engng., Structures Staff, Boeing Airplane Co., Wichita, Kans. Home: 228 South Kansas, Wichita 7, Kans.

FOX, LORICK F., (a) Chief Draftsman, Chesapeake Inst. Corp., Shadyside, Md. Home: Box 238, Rt. 2, Edgewater, Md.

FOX, ZOLA, (m) Sr. Proj. Engr., Reaction Motors, Inc., Denville, N. J. Home: 36 Brentwood Dr., Verona, N. J.

FRADIN, SAMUEL, (m) Proj. Mgr., Engng. Res., Miller Research Labs., 2832 Maisel St., Baltimore 30, Md. Home: 5514 Belle Ave., Baltimore 7, Md.

FRAENKEL, STEPHEN J., (m) Director of Research, Res. & Dev., Standard Railway Equip. Mfg. Co., 310 S. Michigan Ave., Chicago 4, Ill. Home: 328 Oak Circle, Wilmette, Ill.

FRANCIS, IVAN M., (m) Project Engineer, Chrysler Corp., Missile Division, P. O. Box 2628, Detroit 31, Mich. Home: 671 Emmons, Birmingham, Mich.

FRANCISCO, EDWARD E., JR., (m) President, Francisco Engineering Co., P. O. Box 588, Albuquerque, N. M. Home: 828 Monroe St., Albuquerque, N. M.

FRANK, ANTHONY J., (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 167-11 67th Ave., Flushing, N. Y.

FRANK, JAMES H., (s) University of Pittsburgh, Pittsburgh, Pa. Home: 5624 Maple Heights Rd., Pittsburgh 32, Pa.

FRANK, JOHN E., (m) Engr., Instrumentation, Test Department, Engng. & Res. Division, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 10 Cross St., Dover, N. J.

FRANKEL, HENRY, (s) Home: 500 West 177th St., New York 33, N. Y.

FRANKLIN, WALLACE H., (m) Staff Engr., Electro-Mechanical Products Co., 32700 Ford Road, Garden City, Mich.

FRANSON, KARL D., (m) Asist. Engr., Armour Research Foundation, Technology Center, Chicago 16, Ill. Home: 3322 Clinton Ave., Berwyn, Ill.

FRANZEL, ROBERT T., (m) Application Mgr., Commercial Products, Reeves Instrument Corp., 215 E. 91st St., New York, N. Y. Home: 22 Raynham Dr., Syosset, L. I.

FRASHER, CARL L., (m) Test Engr., Missile Systems Development, Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 4219 Hamilton St., San Diego 11, Calif.

FRAVER, WILLIAM C., (s) Case Institute of Technology, 1277 Virginia Ave., Lakewood 7, O.

FRAZEE, RICHARD P., (m) Mgr. of Contracts, Contracts Dept., Reaction Motors, Inc., Denville, N. J. Home: 3307 Powder Horn Green, Sparta, N. J.

FREAR, GEORGE L., (a) Asst. Mgr., Product Devel., Nitrogen Div., Allied Chem. & Dye Corp., 40 Rector St., New York 6, N. Y. Home: Old Anwell Rd., Neshanic, N. J.

FREDERICKS, JIM, (m) Test Engr., Gas Turbine Pump, Rocket Test Dept., Bell Aircraft Co., Wheatfield Plant, Buffalo 5, N. Y. Home: 176 Hamilton Dr., Snyder, N. Y.

FREDRICKSON, HENRY A., (m) Sr. Res. Engr., North American Aviation, Inc., Rocket Division, International Airport, Los Angeles 45, Calif. Home: 19044 Santa Rita, Tarzana, Calif.

FREDHOLD, ALLAN B., JR., (m) Mgr., Commercial Devel., Emsco Mfg. Co., P. O. Box 2098 Terminal Annex, Los Angeles 54, Calif. Home: 801 Amherst Dr., Burbank, Calif.

FREDLUND, NORTON, (s) University of Minnesota, Minneapolis, Minn. Home: 5319 Knox Ave. So., Minneapolis 19, Minn.

FREEMAN, GEORGE B., (m) Staff Engr., Missile Systems Div., Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 19453 Oxnard St., Tarzana, Calif.

FREEMAN, GEORGE L., (s) Univ. of Michigan, Ann Arbor, Mich. Home: Hermit Lane, Westport, Conn.

FREEMAN RICHARD W., JR., (a) Wind Tunnel Engr., Naval Supersonic Lab., Mass. Inst. of Tech., 560 Memorial Dr., Cambridge, Mass. Home: 14 Franklin Rd., Winchester, Mass.

FREEMAN, WILLIAM B., (m) Tech. Director, Temco Aircraft Corp., P. O. Box 6191, Dallas, Tex. Home: 10247 Rosser Rd., Dallas, Tex.

FRENCH, EDWARD P., (m) Sr. Thermodynamics Engr., Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 16714 Tulsa St., Granada Hills, Calif.

FRAZER, HAROLD E., (a) Capt. USAF, APO 970, c/o PM, San Francisco, Calif. Home: 745 Oakdale St. SE, Grand Rapids, Mich.

FRENCH, G. THOMAS, (m) Rocket Facilities Group Leader, Rocket Dept., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 165 No. Ellicott St., Williamsville 21, N. Y.

FREUDENTHAL, LOUIS E., (a) Owner, Valley Insurance Agency, P. O. Box 108, Las Cruces, N. M. Home: 538 W. Las Cruces Ave., Las Cruces, N. M.

FREVERT, GRAHAM C., (s) U. S. Army, Redstone Arsenal, Huntsville, Ala. Home: Rt. #1, Holly Rood, Kan.

FREY, DONALD N., (m) Assoc. Director, Scientific Laboratory, Engng. Staff, Ford Motor Company, 21500 Oakwood Blvd., Dearborn, Mich. Home: 586 Fairfax Rd., Birmingham, Mich.

FRIANT, DAVID R., Engr., Watertown Division, New York Air Brake Company, Watertown, N. Y. Home: 105 Washington St., Watertown, N. Y.

FRIDELL, ROLAND, (m) Aircraft Eng. Specialist, Aircraft Gas Turbine Division, General Electric Co., 777—14th St., NW, Washington, D. C. Home: 2625 Newton St., Silver Spring, Md.

FRIEDMAN, RAYMOND, (m) Atlantic Research Corporation, 901 N. Columbus St., Alexandria, Va. Home: 2645 N. Van Dorn St., Alexandria, Va.

FRIEDRICH, BENNO C., (s) Georgia Institute of Technology, Box 4839 Ga. Tech, Atlanta, Ga. Home: 83-10 35 Ave., Jackson Heights, N. Y.

FRIEDRICH, HANS R., (m) Chief Flight Mechanics Engr., Engng. Dept., Convair, A Division of General Dynamics Corp., Pacific Highway, San Diego 12, Calif. Home: 40615 Patricia Place, San Diego 15, Calif.

FRISCH, JOHN A., (s) Technical Aide, Laboratories Planning, Bell Telephone Laboratories, Inc., 463 West St., New York 19, N. Y. Home: 111-44—133 St., S. Ozone Pk. 20, N. Y.

FRITZ, ALFRED, (a) Deutsches Raketen-und Raumfahrtmuseum, Reinsburgstrasse 54, Stuttgart, Westdeutschland. Home: Stuttgart-Bad Cannstatt, Memmingerstrasse 7, Westdeutschland.

FRITZ, WILLIAM C., (m) Electronics Tech., Holloman Air Development Center, Bell Aircraft Corporation, Box 391, Holloman Air Dev., Center, N. M. Home: 1708 Teresa Lane, Alamogordo, N. M.

FROEHLICH, JACK E., (m) Division Chief, Guided Engineering, Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 2555 Tanoble Dr., Altadena, Calif.

FUHS, ALLEN E., (s) Graduate Res. Assist., California Institute of Technology, Pasadena, Calif. Home: 1124-C East Del Mar, Pasadena, Calif.

FULLER, PAUL N., (m) Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 21320 Velicata, Woodland Hills, Calif.

FURRER, R., (m) Vice President, ACF Industries, Incorporated, 30 Church St., New York 8, N. Y.

G

GABRON, FRANK, (m) Res. Engr., Res. Dept., United Aircraft Co., Silver Lane, E. Hartford, Conn. Home: 2 Stephen St., Manchester, Conn.

GAERTNER, REINHOLD V., (m) Des. Engr., Autopilots, Aero. Division, Minneapolis-Honeywell Reg. Co., 2600 Ridgway Rd., Minneapolis 13, Minn. Home: 1312 E. Maynard Dr., St. Paul, Minn.

GAFFNEY, FRANK J., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 11704 Pearwood Ave., San Fernando, Calif.

GAHN, EDWIN H., (m) Operations Mgr., The Greenleaf Mfg. Co., 7814 Maplewood Ind. Ct., St. Louis 17, Mo. Home: 3021 Capehart Dr., Normandy 20, Mo.

GALAMBOS, JOSEPH A., (m) Res. Engr., Aerophysics Department, North American Aviation, Inc., Downey, Calif. Home: 2426 Cleveland Ave., Montebello, Calif.

GALANE, IRMA B., (a) Electronics Engr., Electronics Division, Navy Department, Bureau of Aeronautics, Washington 25, D. C. Home: 4607 Conecticut Ave., NW, Washington 8, D. C.

GALE, ALFRED J., (m) High Voltage Engineering Corp., 7 University Rd., Cambridge, Mass. Home: 9 Winston Rd., Lexington, Mass.

GALE, JOHN L., (m) Advanced TERRIER Administrative Staff Engr., Convair, A Division of General Dynamics Corp., P. O. Box 1011, Pomona, Calif. Home: 856 W. 7th St., Pomona, Calif.

GALITZA, JOHN P., (m) President, El Monte Rubber Corp., Inc., 1909 N. Central Ave., Elmonte, Calif. Home: 8802 Emperor Ave., San Gabriel, Calif.

GALL, JOHN F., (m) Director, Inorganic Res. Dept., Technical Division, Pennsylvania Salt Mfg. Co., P. O. Box 4388, Philadelphia 18, Pa. Home: 128 Fairview Rd., Penn Valley, Narberth, Pa.

GALLAGHER, ROBERT D., (s) Brooklyn Polytechnic Institute, 85 Livingstone St., Brooklyn, N. Y. Home: 254 - 87th St., Brooklyn, N. Y.

GALLOWAY, GEORGE W., (m) President, G. W. Galloway Co., 25 N. Fourth Ave., Arcadia, Calif.

GALLOWAY, HOWARD L., (m) Physicist, Aero. Ballistics Dept., Aero. Physics Div., Flow Research Br., Naval Ordnance Laboratory, White Oak, Silver Spring, Md. Home: 1323 Poplar Ave., Baltimore 27, Md.

GALLOWAY, JAMES C., (m) Owner, James C. Galloway & Company, 6535 Wilshire Blvd., Los Angeles 48, Calif.

GANNETT, WRIGHT K., (m) Assoc. Director of Res. and Devel., The Weatherhead Co., 300 E. 131st St., Cleveland 8, O. Home: 1525 Farnam St., Davenport, Iowa

GARBELLANO, DAVID W., (m) Vice President, Applied Radiation Corp., 1210 Springbrook Rd., Walnut Creek, Calif. Home: 32 Senior Ave., Berkeley 8, Calif.

GARDNER, ARTHUR J., (Jr.) Design Engineer, Guided Missile Field Test Group, Boeing Airplane Co., PAFB, Cocoa, Fla. Home: 325 Grandview Way, Eau Gallie, Fla.

GARDENHIRE, LAWRENCE W., (m) Chief, Instrumentation & Standards Branch, Electro Mechanical Labs., Ordnance Corps., U. S. Army, White Sands Proving Ground, N. M. Home: Box 112, State College, N. M.

GARNER, ROBERT W., (s) Principle Project Engr., Mech. Engr. Dept., John I. Thompson & Company, 921 17th St. NW, Washington, D. C. Home: 208 Elmira St. SW, Washington 24, D. C.

GARRETT, ELMER E., (m) Engng. Director For Ground Equipment, Ford Instrument Co., 31-10 Thomson Ave., Long Island City 1, N. Y. Home: 284 Green Ave., Freeport, N. Y.

GARRETT, JAMES R., (s) Home: 4337 Fairmount, Kansas City, Mo. Louis, Ill.

GARRISON, STEPHEN G., (s) Parks College of Aero. Tech., East St. Louis, Ill.

GARVEY, JAMES E., (m) Physicist, Rheem Research & Development, 9236 E. Hall Rd., Downey, Calif. Home: 700 S. El Molino Ave., Pasadena, Calif.

GAUBATE, WILLIAM A., (s) Purdue Univ., W. Lafayette, Ind. Home: 5831 N. Delaware, Indianapolis 20, Ind.

GAUL, EDWARD R., (m) Missile Guidance Consultant, Aerophysics Dept., Goodyear Aircraft Corp., Akron, O. Home: 479 Barwell, Akron 3, O.

GAYLORD, ROBERT S., (m) Member of the Technical Staff, The Ramo-Wooldridge Corp., 8820 Bellanca Blvd., Los Angeles 45, Calif. Home: 2023-8 Stewart St., Santa Monica, Calif.

GAYNE, WILLIAM J., (m) Design Trainee, Grumman Aircraft Engineering Corp., Bethpage, N. Y. Home: 8201 Fourth Ave., Brooklyn, N. Y.

GAZDA, ANTOINE, (m) President, Gazda Engineering, 549 Reservoir Ave., Cranston, R. I. Home: The Beechwood, Wakefield, R. I.

GECKLER, RICHARD D., (m) Director of Quality Control, Aerojet-General Corp., Azusa, Calif. Home: 2526 S. Second Ave., Arcadia, Calif.

GEICK, GEORGE H., (a) Assist. Manager, Systems Dept., Mechanical Division, General Mills, Inc., 2003 E. Hennepin, Minneapolis, Minn. Home: 1375 W. Idaho, St. Paul, Minn.

GEIMER, ROBERT G., (m) Design Engineer, Liquid Engine Division, Aerojet General Corp., Box 296, Azusa, Calif. Home: 706 Monterey Ave., Monrovia, Calif.

GEISSLER, ERNST D., (m) Ord. Res. Dev. Div., S-O (Rht.), Fort Bliss, Tex. Home: 1711 Alabama Ave., Huntsville, Ala.

GELB, JOHN, (m) Owner, Gelb Engineering Co., 201 Walbridge Bldg., Buffalo 2, N. Y. Home: 46 Oxford Ave., Buffalo 23, N. Y.

GELLER, R. E., (m) Bendix Aviation Corporation, Fisher Building, Detroit 2, Mich. Home: Statler Hotel, Detroit (temporary)

GELO, JOSEPH W., (m) Systems Electronic Engr., Guided Missile Div., Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 3125 Van Buren St., El Paso, Tex.

GENDEN, SEYMOUR A., (m) Project Engr., Res. Div., Continental Aviation and Engineering Corp., 12700 Kercheval, Detroit 15, Mich. Home: 3731 Burlingame, Detroit 6, Mich.

GENDLER, STANLEY L., (m) Project Engineer, Planning Research Corp., 941 Westwood Blvd., Los Angeles, Calif. Home: 600 Las Casas, Pacific Palisades, Calif.

GENTLE, ERNEST J., (m) President and Editor in Chief, Aero. Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, Calif. Home: 5013 Mt. Royal Dr., Los Angeles 41, Calif.

GENTRY, GEORGE C., (m) Mech. Engr., Research and Development Section, Air Force Missile Test Center, Patrick Air Force Base, Fla. Home: 1055 Mitchell St., Cocoa, Fla.

GEORGE, DINO, Associate Engr. Stress, Dept. 72-25, Lockheed Aircraft Corp., Burbank, Calif. Home: 1419-C West, Alameda, Calif.

GEORGE, RALPH C., (a) Alaska Regional Supervisor, Electronics Division, General Electric Co., Box 1177, Anchorage, Alaska. Home: LaHonda Court, Spenard, Alaska

GEORGIUS, HENRY K., (m) Sr. Res. Engr., Rocketdyne, A Div. of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 21838 Saticoy St., Canoga Park, Calif.

GERDAN, DIMITRIUS, (m) Director of Engineering, Allison Div., General Motors, Corp., P. O. Box 894, Indianapolis 6, Ind. Home: 4634 N. Pennsylvania St., Indianapolis, Ind.

GERDES, RONALD MAMPRE, (s) University of California, Berkeley 4, Calif. Home: 2340 132nd Ave., San Leandro, Calif.

GERHARDSTEIN, KENNETH R., (s) Indiana Technical College, 215-225 Washington Blvd., Ft. Wayne, Ind. Home: 604 W. Washington, Ft. Wayne, Ind.

GERKIN, DONALD E., (m) Engr.. Missile Div., Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles, Calif. Home: 122 E. Neece St., Long Beach 5, Calif.

GERLA, MORTON, Vice President, Marquette Terrace, Inc., 71 Orchard St., Plainview, Long Island, N. Y. Home: 99-27 66th Ave., Forest Hills 74, N. Y.

GERMANO, JOSEPH J., Engng. Rep., Rocket Department, Curtiss-Wright Corp., Caldwell, N. J. Home: 748 Jackman St., Lancaster, Calif.

GERNANDT, HERBERT H., (m) Engng. Designer, Design & Development, JPL, California Institute of Technology, 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 4809 Briggs Ave., La Crescenta, Calif.

GERO, DOANE R., (m) Vice Pres., Airborne Operations, G. M. Giannini Co., Inc., 918 E. Green St., Pasadena, Calif. Home: 3790 Newhaven Rd., Pasadena, Calif.

GERRY, JULIAN E., (m) Assist. Gen. Sales Mgr., Menasco Mfg. Co., 805 So. San Fernando Blvd., Burbank, Calif. Home: 5809 Murietta, Van Nuys, Calif.

GERSHON, MILTON, (m) Sr. Project Engr., Design Div., Reaction Motors, Inc., Denville, N. J. Home: 114 Franklin St., Morristown, N. J.

GERTEIS, ROBERT L., (s) Wichita University, Wichita, Kan. Home: 4005 E. Lewis, Wichita 8, Kan.

GERULAT, THOMAS G., (a) Mail: 32 New Lawn Ave., Arlington, N. J.

GHASTIN, ROBERT W., (m) Field Engng., Repr., Hughes Aircraft Co., Engng. Div., Culver City, Calif. Home: 38719 21st St., Palmdale, Calif.

GIACCO, ALEXANDER F., (m) Tech. Supt., Hercules Powder Co., Kenvil, N. J.

GIANNINI, GABRIEL M., (m) President, G. M. Giannini & Co., Inc., 918 East Green St., Pasadena, Calif. Home: P.O. Box 264, Costa Mesa, Calif.

GIBB, THOMAS R. P., JR., (a) Assoc. Prof. & Director Sponsored Research, Chemistry, Tufts University, Talbot Ave., Medford 55, Mass. Home: 27 Sargent Rd., Winchester, Mass.

GIBBONS, HENRY B., (m) Assist. Chief Engr., Chance Vought Aircraft, Inc., Box 5907, Dallas, Tex. Home: 4526 Brookview Dr., Dallas 20, Tex.

GIBBS, ASA B., (m) Lt. Col., Air Force Program Officer, Project VANGUARD, 105 Kennedy St., Alexandria, Va. Home: 1279 North St., Beaumont, Tex.

GIBBBS, EMILY R., (a) Home: 430 W. Durham Rd., Philadelphia 19, Pa.

GIBSON, CHARLES A., (m) Engineer-Fuselage Design & Structure Analysis, Chrysler Corp., Missile Branch, Engng. Div., Warren, Mich. Home: 1768 Roslyn Rd., Grosse Pointe 36, Mich.

GIBSON, HUBERT I., (m) General Manager, Guided Missile Division, Firestone Tire & Rubber Company, 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 7640 E. Ceceilia, Downey, Calif.

GIBSON, JOHN H., (s) University of Michigan, Ann Arbor, Mich. Home: 2017 Benjamin Ave., Kalamazoo, Mich.

GIBSON, RALPH E., (f) Director, Applied Physics Laboratory, The Johns Hopkins University, 8621 Georgia Ave., Silver Spring, Md. Home: 4815 Cumberland Ave., Chevy Chase 15, Md.

GIBSON, THOMAS F., (m) Sr. Tool Designer, Cleveland Pneumatic Tool Co., 3781 E. 77th St., Cleveland 5, O. Home: 16018 Nelamere Rd., E. Cleveland 12, O.

GIDDINGS, RALPH L., JR., (m) U. S. Army, Guided Missile Project Officer, 31st AAA Brigade, McChord AFB, Wash. Home: 12415 Ave., DuBois, Tacoma 9, Wash.

GIFFORD, WILLIAM E., (m) Engr., Mech. Div., Arthur D. Little Inc., 30 Memorial Dr., Cambridge, Mass. Home: 4 Carlisle Road, Lexington, Mass.

GILBERT, FREDERICK A., (m) Assistant Division Manager, Becco Chemical Division, Food Machinery and Chemical Corporation, Station "B", Buffalo 7, N. Y. Home: 70 Windsor Ave., Buffalo 9, N. Y.

GILBERTSON, JOHN E., (s) Indiana Technical College, 221 West Washington Blvd., Ft. Wayne, Ind. Home: 340 19th St. So. Wisconsin Rapids, Wisc.

GILCHRIST, JOHN D., (m) Manager, Washington Operations, Aerojet-General Corp., 1625 Eye St., N.W., Washington, D. C. Home: 8021 Aberdeen Rd., Bethesda, Md.

GILDENBERG, BERNARD D., (a) R&D Meteorologist, Balloon Branch, Test Facilities Division, ARDC, Holloman AFB, N. M. Home: 801 Cauthen Lane, Alamogorodo, N. M.

GILES, CEDRIC, (m) N. Y. Telephone Co., New York, N. Y. Home: 523 Division Ave., Carlstadt, N. J.

GILES, WILLIAM E., (a) Steam & Refrigeration Engr., Southern Dairies, Inc., 60 "M" St., N.E., Washington, D. C. Home: 4033 Ingraham St., Hyattsville, Md.

GILLEAN, JAMES I., (a) Jr. Engr. Res., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 1260 Gen. Ent. Ct., Billy Mitchell Village, San Antonio, Tex.

GILLESPIE, ROLLIN W., (m) Engineer, North American Aviation, Inc., Downey, Calif. Home: 1748 Orangewood Lane, Arcadia, Calif.

GILLIES, JOSEPH H., (m) Vice Pres. & Gen. Mgr., Gov't & Industrial Div., Philco Corp., Philadelphia 44, Pa. Home: 8369 Fisher Rd., Philadelphia 17, Pa.

GILLILAND, WILLIAM L., (m) President, Gilliland Enterprises, Inc., 420 Lingle Ave., Lafayette, Ind.

GILMAN, RICHARD, (m) President, Precision Equipment Co., Inc., 1642 Border Ave., Torrance, Calif. Home: 5375 Rolling Ridge Rd., Palos Verdes Estates, Calif.

GILPIN, ROBERT D., (m) President, Gilpin Electronics Co., 1440 N. Jefferson, Mt. Pleasant, Tex. Home: Box 2003A5, Tyler, Tex.

GILPIN, SCOTT R., (s) State Univ. of N. Y., Canton, N. Y. Home: 406 Vets Village, Canton, N. Y.

GILSTEIN, JACOB B., (m) Research Associate, New York University, Res. Div., Univ. Hts., Bronx 53, N. Y. Home: 2241 Sedgwick Ave., Bronx 68, N. Y.

GINSBURGH, ALLEN S., (m) Sr. Engr., Solid Eng. Department, Aerojet-General Corporation, 6352 No. Irwindale Ave., Azusa, Calif. Home: 844 E. Bennett St., Glendora, Calif.

GIRAGOSIAN, PAKRAD ANTAR, (m) Aero. Thermodynamisist, Special Defense Projects, General Electric Company, 2900 Campbell Ave., Schenectady, N. Y. Home: 602 - 25th St., Watervliet, N. Y.

GIRARD, JEAN, (m) Ingenieur en Chef des Essais en Vol, Societe Nationale de Constructions Aeronautiques du Sud-Oeust, Aerodrome de Villareche, par Moissy Cramayel (S&M) France.

GIRARD, JOHN, (a) Technician Northrop Aircraft Co., Patrick Air Force Base, Cocoa, Fla. Home: P. O. Box 982, Cocoa, Fla.

GITTENS, E. DONALD, (m) Vice President & Chief Engineer, Arma Division, American Bosch Arma Corporation, Roosevelt Field, Garden City, N. Y. Home: 10 The Spur, Flower Hill, Port Washington, N. Y.

GITTINGS, HOMER T., JR., (m) Staff Member, Los Alamos Scientific Lab., Box 1663, Los Alamos, N. M. Home: 1251 B 41st, Los Alamos, N. M.

GIVEN, FRANK I., (m) Research Engineer, Stanford Research Institute, Menlo Park, Calif. Home: P. O. Box 725, Los Altos, Calif.

GLAHE, FRED R., (s) Purdue University, Michael Goldwin Shops, W. Lafayette, Ind. Home: 530 S. Madison, LaGrange, Ill.

GLANDER, FREDERICK L., (s) A/IC, U.S. Air Force, 808th OPS Sqdn., Bergstrom, AFB. Home: 105 So. 8th Ave., West Bend, Wisc.

GLASSMAN, EDWARD B., (s) Administrative Assistant to the Secretary, The Phillips Exeter ,Academy, Exeter, N. H. Home: 42 Fabyan St., Boston 24, Mass.

GLASSMAN, IRVIN, (m) Assistant Professor, Dept. of Aero. Engng., Princeton University, Princeton, N. J. Home: 120 Prospect Ave., Princeton, N. J.

GLEDHILL, FRANKLIN, (m) Vice President, Pan American World Airways, Inc., 135 East 42nd St., New York 17, N. Y.

GLENNIE, ROBERT D., (m) Design Engr., Liquid Rocket Engines, Aerojet General Corp., Irwindale Ave., Azusa, Calif. Home: 120 So. Wabash Ave., Glendora, Calif.

GLIEBE, ROBERT L., (s) Sacramento Jr. College, Sacramento, Calif. Home: 1901 - 43rd St., Sacramento 19, Calif.

GLOSSA, MILTON, (m) Assist. to Ch. Engr., Engng. Dept., Aircraft Comp. Div., Dunbar-Kapple Inc., Island Ave., Batavia, Ill. Home: 330 Ingleside, Aurora, Ill.

GNIEWEK, THOMAS T., (a) Junior Engineer, Electrochemical Dept., Chlorinated Hydrocarbons Div., E. I. du Pont de Nemours & Co., Inc., Buffalo Ave., Niagara Falls, N. Y. Home: 613 31st St., Niagara Falls, N. Y.

GOALWIN, DANIEL S., (a) Proj. Engr., Research & Component Development Div., Reaction Motors Inc., Denville, N. J. Home: 1 Mill Rd., Morris Plains, N. J.

GOBLIRSCH, VIRGIL F., (m) Electronic Tech. (Gen.), Vanguard, Naval Research Lab., Washington 25, D. C. Home: 5800 Dewey St., Cheverly, Md.

GODFREY, P. WHITSON, (m) Proj. Group Engr., Missile Engng. Division, McDonnell Aircraft Company, Box 516, St. Louis, Mo. Home: 1209 Laredo Ave., St. Louis 15, Mo.

GOE, RONALD T., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 19418 Cantara St., Reseda, Calif.

GOLAY, MARCEL J. E., (m) Chief Scientist, Squier Signal Laboratory, Ft. Monmouth, N. J. Home: 116 Ridge Rd., Rumson, N. J.

GOLD, MARVIN H., (m) Associate Director, Chemical Dept., Aerojet-General Corp., 6352 N. Irwindale Ave., Azusa, Calif. Home: 3739 Landfair Rd., Pasadena 8, Calif.

GOLDBERG, LEON, (s) New York University, Bronx 53, N. Y. Home: 104 Lefferts Rd., Yonkers, N. Y.

GOLDBURG, ARNOLD, (s) Forrestal Research Center, Princeton University, Princeton, N. J. Home: 5 Cleveland Lane, Princeton, N. J.

GOLDEN, JACK, (m) Director, Turbo Engineering Dept., American Machine & Foundry Co., 12270 Montague St., Pacoima, Calif. Home: 12105 Laurel Terrace Dr., Studio City, Calif.

GOLDENBERG, ALFRED D., (s) University of California, Berkeley, Calif. Home: 431 S. Palm Springs, Calif.

GOLDMAN, JACK R., (m) Field Service Representative, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: c/o Rocketdyne, P. O. Box 107, Boron, Calif.

GOLDMAN, RICHARD G., (m) Engineer, General Electric Co., Turbine Division, Schenectady, N. Y. Home: 1498 Dorwaldt Blvd., Schenectady 9, N. Y.

GOLDSMITH, MARTIN, (m) Associate Engr., Engng. Division, Rand Corporation, 1700 Main St., Santa Monica, Calif. Home: 540 Glenrock, Los Angeles 24, Calif.

GOLDSTEIN, LEONARD, (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 35-64 - 89th St., Jackson Heights 72, N. Y.

GOMPERTZ, RICHARD F., (m) Chief, Rocket Engine Test Laboratory, Air Force Flight Test Center, Edwards, Calif. Home: 1304 Community Rd., Edwards, Calif.

GONGWER, CALVIN A., (m) Manager, Aerojet-General Corp., Underwater Engine Div., P. O. Box 296, Azusa, Calif. Home: 656 N. Michigan Ave., Glendora, Calif.

GONZALES, RUDOLPH, (s) Missile Development Div., North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 4448 Palmero Dr., Los Angeles 65, Calif.

GOODING, JACK D., (m) Power Plant Engr., Missiles Division, Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 1745 Selby Ave., Los Angeles 24, Calif.

GOODLOE, JOHN H., (m) Prov. Engr., Mech. Engng. Dept., Thiokol Chemical Corp., Redstone Division, Huntsville, Ala. Home: 216 Parklane Ave., Huntsville, Ala.

GOODMAN, LEON J., (a) Design Draftsman, Engng. Dept., Walter Motor Truck Co., 1001 Irving Ave., Brooklyn 27, N. Y. Home: 1695 Topping Ave., New York 57, N. Y.

GOODREAU, ALBERT J., (m) Assist. Senior Engr., Missile Projects Group, Test and Field Service Division, Aerojet-General Corp., Irwindale Ave., Azusa, Calif. Home: 205 San Felipe St., Pomona, Calif.

GOOZE, ARNOLD, (m) Supervisor, Solid Rocket Testing, Test and Field Service Division, Aerojet-General Corp., 6352 N. Irwindale, Azusa, Calif. Home: 740 N. Alfred, Los Angeles 34, Calif.

GORDON, ALAN, (a) Owner, Gordon Enterprises, 5362 No. Cahuenga Blvd., No. Hollywood, Calif. Home 5509 Matilija, Van Nuys, Calif.

GORDON, GILBERT, (s) New York University, Rm. 304 Loew Hall, University Heights, Bronx 53, N. Y. Home: 13 Lounsburg Ave., Norwalk, Conn.

GORDON, M. J., (m) Chief, Preliminary Design & Aero., Beech Aircraft Corp., Wichita, Kan. Home: 1129 N. Old Manor Rd., Wichita, Kan.

GORDON, ROBERT, (m) Assist. Chief Engr. for Aircraft Eng., Liquid Engine Division, Aerojet-General Corp., 6352 N. Irwindale Ave., Azusa, Calif. Home: 358 W. Leeside St., Glendora, Calif.

GORDON, SANFORD, (m) Aeronautical Research Scientist, Rocket Branch, NACA, Lewis FPL, 21000 Brook Park Rd., Cleveland 11, O. Home: 928 Paxton Rd., Cleveland 8, O.

GORE, MARVIN R., (m) Development Engr., Aerojet-General Corp., Azusa, Calif. Home: 136 N. Irving Blvd., Los Angeles, Calif.

GORE, WILLIAM L., (m) Director of Sales, Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 2771 Woodlyn Rd., Pasadena 8, Calif.

GORSE, NORVILLE J., (m) Technical Engr., Jet Engine Dept., Engng., General Electric Co., Evendale Plant, Evendale, O. Home: 616 Maple Dr., Cincinnati 15, O.

GORSKI, JOSEPH PAUL, (a) Mechanical Engineer, Remington Rand, Inc., Norwalk, Conn. Home: 44 Brown Ave., Stamford, Conn.

GOSE, ROBERT OREN, (m) Western Tech. Rep., Rocket Fuels Division, Phillips Petroleum Company, McGregor, Tex. Home: 555 S. Barrington Ave., Los Angeles 49, Calif.

GOSLEE, JOHN W., (m) Sr. Service Engr., Fuel Metering Technical Service Dept., Bendix Products Division, Bendix Aviation Corp., 501 Bendix Dr., South Bend, Ind. Home: 1343 Beutter Lane, South Bend, Ind.

GOTKIEWICZ, JULIAN A., (m) Test Engr., Eng. Test Lab., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 4720 Jutland Dr., San Diego 17, Calif.

GOTTLIEB, LAWRENCE K., (s) College of Engineering, New York University, University Hgts., Bronx 53, N. Y. Home: 115-20—229th St., Cambria Hgts. 11, N. Y.

GOULD, ROGER K., (a) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 15471 Moor Park St., Encino, Calif.

GOVIGNON, EDWARD C., (m) Proj. Engr., Preliminary Design Dept., Reaction Motors Inc., Ford Rd., Denville, N. J. Home: 38 B. Brookside Dr., Clifton, N. J.

GRABAU, EDGAR B., (m) Res. Chemist, Chemistry Section, Redel Inc., 401 Julianna, Anaheim, Calif. Home: 311 N. Drake, Fullerton, Calif.

GRAEBER, RALPH P., (m) Mech. Engr., Data Reduction, RCA Systems Engineering, Patrick A.F.B., Fla. Home: Rt. 2, Box 200, Cocoa, Fla.

GRAETZER, GUNTHER R., (m) Head of Department, Aeronautical Engineering, Institute of Technology, USAF, Wright-Patterson Air Force Base, O. Home: 2 Lonsdale Ave., Dayton 9, O.

GRAF, HENRY R., (m) Des. Engr., Rocket Dept., Bell Aircraft Corp., P. O. Box 1, Buffalo, N. Y. Home: 145 Traverse Blvd., Kenmore 17, N. Y.

GRAHAM, ALFRED R., (m) Res. Assist., Jet Propulsion Center, Purdue University, West Lafayette, Ind. Home: 412 Dodge St., West Lafayette, Ind.

GRAHAM, BEARDSLEY, (m) Executive Vice President, Sequoia Process Corporation, 871 Willow St., Redwood City, Calif. Home: 240 Parkside Dr., Palo Alto, Calif.

GRAHAM, DONALD I., JR., Coordinator Field Protective Measures & Human Engineering, Tech. Dev. Br., Research & Development Div., Redstone Arsenal, Huntsville, Ala. Home: 807 Locust St., Huntsville, Ala.

GRAHAM, HARRY M., (m) Prop. Proj. Engr., Engng. Dept., Chance Vought Aircraft Corp., Dallas, Tex. Home: 4729 Rock Port Dr., Dallas 32, Tex.

GRAHAM, RICHARD M., (m) Manager, Quality Control Department, Missile Operations, Chrysler Corp., P. O. Box 2628, Detroit 31, Mich. Home: 32550 Nottingham Knoll, Farmington, Mich.

GRAHAM, ROBERT W., (m) Aero. Res. Scientist, Lewis Flight Prop. Lab., NACA, 21000 Brookpark Rd., Cleveland, O. Home: 22895 Haber Dr., Cleveland 26, O.

GRAHAM, RONALD A., (m) Manager of Contract Research, Wyandotte Chemicals Corp., Research & Development Div., Wyandotte, Mich. Home: 2393 - 23rd St., Wyandotte, Mich.

GRANLUND, KARL G., (a) Installation Engr., Aero. Engineering Co., 220 Old Country Rd., Mineola, N. Y. Home: 75 Florence Dr., Syosset, N. Y.

GRANT, KENNETH O., (s) University of Minnesota, Minneapolis, Minn. Home: 1201 N. 21st St., Superior, Wisc.

GRATIOT, JOHN P., (a) The Gratiot Engineering Company, 3 Central St., Woodstock, Vt. Home: Otis Hill Farm, Woodstock, Vt.

GRAUPE, RUDOLF L., (m) Chief Proj. Engr., Engng., Fairchild Eng. & Airplane Corp., Deer Park, L. I., N. Y. Home: 19 Old Town Lane, Halesite, N. Y.

GRAY, FOSTER L., (a) Second Lieutenant, Assist. Ordnance Liaison Officer, U. S. Army, Ft. Monmouth, N. J., Ord. Liaison Office, Hq. TSS, Ft. Monmouth, N. J. Home: 52 Dunbar Ave., Long Branch, N. J.

GRAY, ROBERT H., (m) Sr. Rocket Instrumentation Engr., Rocket Dept., Bell Aircraft Corporation, P. O. Box #1, Buffalo 5, N. Y. Home: 348—78th, Niagara Falls, N. Y.

GRAY, WILLIAM L., (m) Senior Group Engineer, Operational Analysis, Preliminary Design, Pilotless Aircraft, Boeing Airplane Co., 7755 E. Marginal Way, Seattle 8, Wash. Home: 11223 37th Ave., S.W., Seattle 66, Wash.

GREEN, BIGELOW, (a) Technical Writer, Missile Systems Division, Raytheon Manufacturing Co., Bedford Airport, Bedford, Mass., Home: 12 Gloucester St., Boston 16, Mass.

GREEN, CHARLES F., (m) Manager, Advance Development, Aeronautic and Ordnance Systems Div., General Electric Co., Schenectady, N. Y. Home: 1303 Union St., Schenectady, N. Y.

GREEN, CHARLES J., (m) Estimating Engineer, 6111 Project Tool Engineering, Hughes Aircraft Co., Nogales Highway, Tucson, Ariz. Home: 4301 Oracle Rd., Tucson 11, Ariz.

GREEN, LEON, JR., (m) Senior Engineer, Solid Engine Dept., Aerojet-General Corp., Box 296, Azusa, Calif. Home: 2704 Lark Hill Dr., W. Covina, Calif.

GREENBERG, ARTHUR B., (a) Development Engr., Liquid Engine Division-Study Dept., Aerojet-General Corp., Azusa, Calif. Home: 8919 E. Live Oak Ave., Temple City, Calif.

GREENBERG, NATHANIEL F., (s) College of Engineering, New York University, University Ave. & 181st St., Bronx 53, N. Y. Home: 2085 Morris Ave., Bronx 53, N. Y.

GREENBERG, STANLEY, (m) Design Engr., Aerojet-General Corp., Box 1947, Sacramento, Calif. Home: 4305 Cottage Way, Sacramento, Calif.

GREENBLATT, LOUIS W., (m) President, The Greenleaf Manufacturing Co., Maplewood Industrial Court, St. Louis 17, Mo. Home: 8 Lingworth Lane, St. Louis 17, Mo.

GREENE, FREDERICK H., JR., (m) Administrator, Nuclear Energy Dept., National Research Corp., 70 Memorial Dr., Cambridge, Mass. Home: Weston Rd., Lincoln, Mass.

GREENFIELD, HAROLD H., (m) Devel. Engr. 'A", Res. Department, Aerojet-General Corp., Azusa, Calif. Home: 4660 No. Larkin, Covina, Calif.

GREENFIELD, STANLEY P., (a) Supervisor-Research, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 5246 No. Allott Ave., Van Nuys, Calif.

GREENSHIELDS, ROBERT J., (m) Director of Research, Wood River Research Laboratory, Shell Oil Company, P. O. Box 262, Wood River, Ill. Home: 556 Whitelaw Ave., Wood River, Ill.

GREENWOOD, STUART W., (m) Lecturer, College of Aeronautics, Cranfield, Bletchey, Bucks., England. Home: 2 Tower Walk, Weston S. Mare, Somerset, England

GREETHAM, LT. FRANCIS F., (m) USAR, Corporal Project, STD, WSPG, New Mex. Home: U. S. Navy BOG, WSPG, New Mex.

GREGG, DAVID, (m) Deputy Chief, Integrated Range Mission, White Sands Proving Ground, N. M. Home: 415 W. Madrid, Las Cruces, N. M.

GREGORY, ALFRED T., (m) Chief Engr., Research & Advanced Engng., Fairchild Engine Division, Fairchild Engine & Airplane Corporation, Deer Park, N. Y. Home: Shelter Rock Rd., Manhasset, N. Y.

GREGORY, JOHN R., (m) Mgr., Aircraft Division, Thompson Products Limited, 37 Louth St., St. Catherines, Ontario, Canada. Home: 156 Geneva St., St. Catherines, Ontario, Canada.

GREINACHER, RICHARD, (m) Sec. Chief, Service Technique Militaire, Berne, Switzerland. Home: Frikartweg 9, Berne, Switzerland.

GRENUS, MICHAEL, (m) Prelim. Des. Engr., Missile Operations, Chrysler Corp., Box 2628, Detroit 31, Mich. Home: 8291 River Rd., Utica, Mich.

GREPKE, HARRY A., (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: 4117 Woodhill Dr., Ft. Wayne, Ind.

GRIECO, L. MICHAEL, (m) Design Engr., Engineering, Republic Aviation Corp., Farmingdale, L. I., N. Y. Home: 384 Main St., White Plains, N. Y.

GRIFFIN, DONALD N., (m) Associate Director, Liquid Propellant Application Research, Aviation Division, Olin Mathieson Chemical Corporation, Box 480, Niagara Falls, N. Y. Home: 8218 Bollier Ave., Niagara Falls, N. Y.

GRIFFIN, JERRY, (s) Engng. Aide, Aerojet-General Corp., Sacramento, Calif. Home: 3007 Valkyre Way, Sacramento, Calif.

GRIFFITHS, FRANKLIN E., (a) Mech. Des. Engr., Ordnance Dept., Rheem Mfg. Co. Res. & Dev., 9236 East Hall Rd., Downey, Calif. Home: 2165 W. Broadway Ave., Anaheim, Calif.

GRINYER, CHARLES A., (m) Vice President, Engineering, Orenda Engines Ltd., Box 4015 Terminal "A", Toronto Canada. Home: R.R. #1, Caledon, Ontario.

GRISETTI, ROBERT S., Supervisor, LMEED, General Electric Co., French Road, Utica, N. Y. Home: 67 Root St., New Hartford, N.Y.

GROCHOWSKI, MITCHELL, (a) Inspection Operations, Chrysler Corporation, 3811 Van Dyke Sterling Twp., Warren, Mich. Home: 20078 Patton, Detroit 19, Mich.

GRONICH, SIGMUND, (s) Junior Test Engineer, Wright Aeronautical Division, Curtiss-Wright Corporation, Wood Ridge, N. J. Home: 21-66 33rd Rd., Long Island City 6, N. Y.

GROSCH, HERBERT R. J., Manager, Investigations Section, Aircraft Gas Turbine Development Department, General Electric Company, Evendale Plant, Cincinnati 15, O. Home: 191 Compton Rd., Cincinnati 15, O.

GROSEWALD, PETER, (s) City College of N. Y. Home: 1602-B, 455-B Franklin D. Roosevelt Dr., New York, N. Y.

GROSS, BERNARD, (s) University of California, Los Angeles, 17448 Miranda, Van Nuys, Calif.

GROSS, GERALD C., (m) Captain USNR, Assistant Secretary-General, International Telecommunication Union, Palais Wilson, Geneva, Switzerland.

GROSS, JOSEPH F., (s) School of Chemical Engineering, Purdue University, West Lafayette, Ind. Home: 323 University St., West Lafayette, Ind.

GROSS, ROBERT A., (m) Res. Engr., Engine Division, Fairchild Eng. & Airplane Co., Deer Park, L. I., N. Y. Home: 137 Old Oak Lane, Levittown, L. I.

GROSSKLAUS, ALBERT A., (m) Res. Engr., Missile Dept., Lockheed Aircraft, 7701 Woodley, Van Nuys, Calif. Home: 6510 Jamieson Ave., Reseda, Calif.

GROVER, JOHN H., (m) Atlantic Research Corporation, 901 N. Columbus St., Alexandria, Va. Home: 408 Lloyds Lane, Alexandria, Va.

GRUBER, ALAN R., (m) Division Director, Nuclear Development Corp. of America, 5 New St., White Plains, N. Y. Home: North Lake Rd., Armonk, N. Y.

GRUNERT, ROLAND E., (a) United States Army (England), Hq. 32nd AAA Brigade, APO 125, N. Y., N. Y. Home: 157-21—12th Ave., Whitestone, N. Y.

GUARALDI, LEONARD A., (m) Vice President, Chief Engr., Bond Research Labs. Inc., 84 Winslow Ave., Somerville 48, Mass. Home: 19 Parkhurst Rd., Chelmsford, Mass.

GUARINO, ROGER C., (m) Assist. to Manager, Talos Section, American Machine & Foundry Co., Greenwich, Conn. Home: 514 Gramatan Ave., Mt. Vernon, N. Y.

GUENDEL, HERBERT H., (m) Technical Assistant, Bell Aircraft Corporation, General Engineering Lab., Wheatfield Plant, Niagara Falls, N. Y. Home: 783 E. Highland Ave., Buffalo 23, N. Y.

GUEST, THOMAS E., (m) Hydro-Lab. Proving Grounds, Aerojet-General Corp., 6352 N. Irwindale Ave., Azusa, Calif. Home: 428 E. Alosta, Glendora, Calif.

GUILD, CALVIN C., (s) New Mexico College of A. & M. Home: Box 343, State College, N. M.

GUNTER, THOMAS E., (s) Home: 1018 California St., Huntsville, Ala.

GURSKI, GUY S., (s) Indiana Technical College, Ft. Wayne, Ind. Home: 3rd Avenue Ent., Frankfort, N. Y.

GURSKIS, JOSEPH, R., (m) Res. Engr., North American Aviation, Inc., Santa Susana, Calif. Home: 3002 4th St., Santa Monica, Calif.

GUTERMAN, FREDERICK H., (m) Assistant Vice President, Programs and Customer Relations, Arma, A division of American Bosch Arma Corporation, Roosevelt Field, Garden City, N. Y. Home: 1200 Fifth Ave., New York 29, N. Y.

GUTHRIE, CHARLES REX, (a) Research Engineer, Preliminary Design, North American Aviation, Inc., 5th Ave., Columbus, O. Home: 1572½ Minnesota, Columbus 11, O.

GUZEKO, MAX E., Service Rep., Reaction Motors, Inc., Denville, N. J. Home 44639 Cedar St., Lancaster, Calif.

GUZZO, ANTHONY T., (a) Chemical Engineer, Elkton Division, Thiokol Chemical Corporation, Elkton, Md. Home: 32 Martindale Dr., Newark, Del.

GWINNER, WALTER C., (m) Supervisor of Market Research, Market Development, Commercial Solvents, Inc., 260 Madison Ave., New York 16, N. Y. Home: 63 Sylvan Knoll Rd., Stamford, Conn.

H

HAAG, GORDON E., (m) Research Specialist, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 24508 Wing Field Rd., Calabasas, Calif.

HAAS, J. DONALD, (m) Assist. Washington Rep., Reaction Motors, Inc., 1833 Jefferson Place, N.W., Washington 6, D. C.

HAAS, JOHN E., (a) Instrumentation Tech., Aerojet-General Corp., P. O. Box 1168, Sacramento, Calif. Home: 1517 G St., Sacramento, Calif.

HAASE, GERHARD, (s) Home: 11651—14th St., Apt. 103, Detroit 6, Mich.

HABERMAN, EUGENE G., (a) Assist. Proj. Engr., Power Plant Laboratory, Wright Air Development Center, WPAFB, O. Home: 604 Superior Ave., Dayton 7, O.

HABERSTROH, ALEX, (a) Russell & Haberstroh, Inc., 111 E. 28th St., New York 16, N. Y. Home: 479 Sixth Ave., New York 11, N. Y.

HACHERL, REGIS A., (m) Associate Research Engr., A Power Plant Research, Boeing Airplane Co., Seattle, Wash. Home: 4601—119th Ave., S.E., Bellevue, Wash.

HACKER, DAVID S., (a) Thermal Kineticist, Development Dept., Combustion Subsection, General Electric Co., AGT., Evendale, O. Home: 7008 Glenmeadows Lane, Cincinnati 37, O.

HACKER, GEORGE T., (m) Proj. Test Engr., Test Equipment Engng., Hughes Aircraft Co., P. O. Box 5555, Tucson, Ariz. Home: 2445 N. Oracle Rd., Tucson, Ariz.

HACKETT, CHARLES M., (a) 96th Ordnance Co., GMD—SCPL, APO 185, N. Y. Home: RSA, Huntsville, Ala.

HACKMAN, K. V., (m) President & Gen. Mgr., Southwest Products Co., 1705 S. Mountain, Duarte, Calif. Home: 1124 Rancho Rd., Arcadia, Calif.

HADDAD, MICHAEL T., (s) Electronic Test Engr., Bendix Aviation Corporation, Research Laboratories Division, 4855 Fourth Ave., Detroit, Mich. Home: 4438 Niagara St., Wayne, Mich.

HADEN, JIMMIE B., (a) Des. Draftsman, Power Plant, Convair, A Division of General Dynamics Corp., Grant's Lane, Ft. Worth, Tex. Home: 5213 Vicke, Ft. Worth, Tex.

HADLEY, WILLIAM L., (m) Dynamics Engr., Bell Aircraft Corp., P. O. Box 1, Buffalo, N. Y. Home: 319 Westchster, Kenmore 17, N. Y.

HAEFELI, RUDOLPH C., (m) Sr. Engr., Aerodynamics, The Martin Co., Baltimore 3, Md. Home: 6315 Holly Lane, Baltimore 12, Md.

HAEUSSERMANN, WALTER, (m) Chief of Guidance & Control Branch, Guided Missile Development Division, Redstone Arsenal, Huntsville, Ala. Home: 906 Sandlin St., Huntsville, Ala.

HAGENMAIER, CARL F., (m) Military Coordinator, Military Sales Dept., Missile Systems Div., Lockheed Aircraft Co., Van Nuys, Calif. Home: 3956 Palos Verdes Dr. N., Palos Verdes Estates, Calif.

HAGIST, WARREN M., (a) Assistant Professor of Mechanical Engineering, University of Rhode Island, Kingston, R. I. Home: Tower Hill Rd., Saunderstown, R. I.

HAGLER, LOUIS H., (a) Electronic Specialist, Technical Analysis Division, HADC, Holloman A.F.B., N. M. Home 2203 Aspen Dr., Alamogordo, N. M.

HAHN, JACK R., (a) Supr. Large Thrust Chamber Ass'ys., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 20155 Bryant St., Canoga Park, Calif.

HAHN, JOYCE A., Home: 20155 Bryant St., Canoga Park, Calif.

HAHN, MILTON C., (m) Chief, Inspection Office, Rocket Engine Test Lab., Air Force Flight Test Center, Edwards AFB, Calif. Home: P. O. Box 347, Edwards, Calif.

HAIT, JAMES M., (m) Vice President; Manager of Ordnance Division, Food Machinery and Chemical Corporation, 1105 Coleman Ave., San Jose 6, Calif. Home: 11199 Canon Vista Dr., San Jose 27, Calif.

HAKENJOS, FRED M., (m) Mgr., Smokeless Powder Sales, Explosives Dept., Hercules Powder Co., Wilmington 99, Del. Home: 608 Lore Ave., Wilmington 3, Del.

HALECKY, JOHN P., (s) Chemical Corn Exchange Bank, 1 E. 42nd St., New York 17, N. Y. Home 351—11th St., Brooklyn, N. Y.

HALEY, ANDREW G., (m) Attorney-at-Law, Haley, Doty & Wollenberg, 1735 DeSales St. N.W., Washington 6, D. C.

HALEY, EARLE D., JR., (m) Liquid Rocket Plant, Aerojet-General Corp., P.O. Box 1947, Sacramento, Calif. Home 4028 Ridge St., Fair Oaks, Calif.

HALL, HOWARD H., (s) Home: 11 Moser Place, Mt. Clemens, Mich.

HALL, JAMES N., (s) California Institute of Technology, Pasadena, Calif. Home: 1515 Rose Villa St., Pasadena 4, Calif.

HALL, KIMBALL P., (m) Sr. Research Engineer, JPL, California Institute of Technology, 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 4209 Hampstead Rd., Pasadena 3, Calif.

HALL, RUSSELL S., (m) Section Chief, Preliminary Design, Allison Division General Motors Corp., Indianapolis 6, Ind. Home: 77 St. N. Dr., Clarendon Rd., R.R. 14, Box 883, Indianapolis, Ind.

HALL, THEODORE F., (a) 1st Lt., USAF, Box 824, Holloman AFB, New Mex.

HALL, WESLEY L., (s) USA, Ft. Bliss, Tex. Home: 49 E. Burdick St., Oxford, Mich.

HALL, WILLIAM W., JR., (m) Capt. U. S. Army Signal Corps. Home: 325 Bath Ave., Apt. 7, Long Branch, N. J.

HALLAM, ROBERT S., (m) Senior Test Engineer, Engineering Test Laboratory, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 6551 Calmont, Ft. Worth, Tex.

HALLIDAY, JOHN W., (m) Engr., Aircraft Gas Turbine Development Dept., General Electric Co., Malta Test Station, Ballston Spa, N. Y. Home: Hotel Schenectady, Schenectady, N. Y.

HALLMAN, JOHN R., (m) Thermodynamic Engineer, Convair, A Division of General Dynamics Corp., San Diego 12, Calif. Home: 621 Dennis Ave., Chula Vista, Calif.

HALPERIN, HERBERT H., (m) Sales Engr., Microwave Electronics Division, Sperry Gyroscope Company, Lake Success, Long Island, N. Y. Home: 156 Willowood Dr., Wantagh, N. Y.

HALPIN, EUGENE P., (m) Technical Assistant to General Manager, Missile Section, Bendix Products Division, Bendix Aviation Corporation, 400 South Beiger St., Mishawaka, Ind. Home: 1444 South Bend Ave., South Bend, Ind.

HAMANN, KENNETH R., (m) Chief Engr., Cleveland Recording Company, 1515 Euclid Ave., Cleveland 15, O. Home: 22220 Macbeth, Parkview, O.

HAMBLEN, DAVID P., (s) Tulane University, New Orleans, La. Home: 6016 Vicksburg St., New Orleans 24, La.

HAMILTON, JERRY, (s) Lee College, Lee Dr., Baytown, Tex. Home: 2100 Nolan, Baytown, Tex.

HAMLIN, CHAUNCEY J., JR., (m) Project Engineer—Rocket Eng., Facility, North American Aviation, Inc., East Slauson St., Los Angeles, Calif. Home: 534 Palmetto Dr., Pasadena 2, Calif.

HAMMOND, JAMES M., (s) Home: 3316 Government Way, Seattle 99, Wash.

HAMPEL, VIKTOR E., (s) Meteorology Branch, Signal Corps, 9771 TU, Dugway Proving Grounds, Utah. Home: 1306 Westminster, Alhambra, Calif.

HANCOCK, WILLIAM L., (m) Electronic Engr., White Sands Proving Ground, Las Cruces, N. M. Home: Box 446, Mesilla Park, N. M.

HANEWINCKEL, DOYLE, JR., (s) Univ. of Southern California, Los Angeles 7, Calif. Home: 4111 E. 11th St., Long Beach 4, Calif.

HANEY, BYRON E., (m) Development Engr., Rocket Section, Bell Aircraft Corporation, Post Office Box One, Buffalo 5, N. Y. Home: 6505 Malvey St., Ft. Worth, Tex.

HANNUM, RICHARD W., (m) Combustion Development Engr., Aviation Gas Turbine Division, Westinghouse Electric Corp., 95th & Troost Sts., Kansas City, Mo. Home: 44 East Concord Ave., Kansas City, Mo.

HANRAHAN, JAMES S., (a) Center Historian, Historical Division, Holloman Air Development Center, Holloman Air Force Base, N. M. Home: P. O. Box 813, Holloman AFB, N. M.

HANSELL, HAYWOOD S., (m) Maj. Gen. USAF (Rtd), Senior Consultant, Defense Planning Service, General Electric Company, 425 13th St., N.W., Washington 4, D. C. Home: #1 Pike Branch Dr., Wilton Woods, Alexandria, Va.

HANSEN, LARRY J., (m) Design Engineer, Armour Research Foundation, 10 W. 35th St., Chicago, Ill. Home: P. O. Box 193, Palos Park, Ill.

HANSEN, WALTER J., (m) Engr., Designer "A", Pilotless Aircraft Division, Boeing Airplane Co., Seattle 14, Wash. Home: 11830—23rd Ave. S.W., Seattle 66, Wash.

HANSON, WILLARD E., (s) Home: 300 San Antonio Rd., Arcadia, Cal.

HAPPEL, JOHN, (m) Professor and Chairman Department of Chemical Engineering, New York University, Univ. Heights, New York 53, N. Y. Home: 470 N. Broadway, Yonkers, N. Y.

HARBISON, JOSEPH W., (a) Sales, James C. Galloway & Co., 6535 Wilshire Blvd., Los Angeles 48, Calif. Home: 1415 Bradbury Rd., San Marino, Calif.

HARDIE, JAMES E., (m) Specifications Group Leader, Goodyear Aircraft Corp., 1210 Massilon Rd., Akron, O. Home: 1968 Ayers Ave., Akron 13, O.

HARDING, WM. BARCLAY, (m) Partner, New Business, Smith, Barney & Co., 14 Wall St., New York 5, N. Y. Home: Holmdel, N. J.

HARFORD, JAMES J., (m) Executive Secretary, American Rocket Society, 500 Fifth Ave., New York 36, N. Y. Home: 58 Deer Path, Princeton, N. J.

HARGADON, VINCENT J., (s) Parks College, E. St. Louis, Ill.

HARKIEWICZ, CHESTER, (a) Checker-Print, Atlantic Design Co., 796 Broad St., Newark, N. J. Home: 20 Dogwood Lane, Colonia, N. J.

HARMON, FRED, (m) Vice President, Southwestern Engineering & Euipment Co., 3906 Lemmon Ave., Dallas, Tex. Home: 576 Brookhurst St., Dallas, Tex.

HARDY, MAURICE M., (m) Design Engineer, G. O. Norville & Assoc., Inc., 906 So. Robertson Blvd., Los Angeles 35, Calif. Home: 1953 Benecia Ave., Los Angeles 25, Calif.

HARPER, ALFRED Y., (s) University of Mississippi, P.O. Box 462, University, Miss. Home: 735 Belhaven, Jackson, Miss.

HARRIS, ALBERT VICTOR, (m) Eastern Sales Mgr., Haynes Stellite Co., 30 E. 42nd St., New York, N. Y. Home: P. O. Box 39, Lake Mohawk, N. J.

HARRIS, ALVIN M., (s) Los Angeles City College, 855 N. Vermont Ave., Los Angeles 29, Calif. Home: 2123 Tiebout Ave, New York 57, N. Y. Mailing: 5341 Romaine St., Los Angeles 29, Calif.

HARRIS, CHESTER A., JR., (a) Assistant Shop Superintendent, Chicago Bridge & Iron Co., 1305 W. 105th St., Chicago 43, Ill. Home: 10873 S. Prospect, Chicago 43, Ill.

HARRIS, J. H., (m) Vice President - Planning, Brush Electronics Company, 3405 Perkins Ave., Cleveland 14, O. Home: 167 Hudson St., Hudson, O.

HARRIS, WILLIAM P., (s) Laboratory Technician, Central Research Laboratory, Celanese Corporation of America, P. O. Box 1000, Summit, N. J. Home: Hickory Tavern Rd., Meyerville, R.D. 1, Chatham, N. J.

HARRISON, ARTHUR E., (m) Director of Engineering, Fairchild Engine & Airplane Corp., Straight Path, Wyandanch, N. Y. Home: 16 Pineridge Rd., Greenvale, N. Y.

HARRJE, DAVID T., (a) Res. Engr., Power Plant Research, Jet Propulsion Laboratory, C.I.T., 4800 Oak Grove Dr., Pasadena, Calif. Home: 1621 Raymond Hill Rd., So. Pasadena, Calif.

HARROD, HARVEY T., (m) Manager, Government Contract Administration, Electronic Tube Division, Westinghouse Electric Corp., P. O. Box 284, Elmira, N. Y. Home: 707 Fern Dew Dr., Elmira, N. Y.

HARSHBARGER, FREDERICK C., (s) California Inst. of Technology, Home: RFD #1, North Liberty, Iowa.

HARSLEM, ERIC W., (m) Chief, Test Dept., Engr. & Research Division, Reaction Motors, Inc., Denville, N. J. Home: 21 Lookout Rd., Mt. Lakes, N. J.

HART, ALEXANDER, (s) Newark College of Engineering, 363 High St., Newark, N. J. Home: 615 Adams Ave., Elizabeth, N. J.

HART, LEON C., (a) Administrative Assistant, Physical Science Lab., New Mexico College of A&MA, P. O. Box 548, State College, N. M. Home: 142, State College, N. M.

HART, RICHARD H., (s) Indiana Tech. College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: 1056 W. 165 Place, Gardena, Calif.

HARTDEGEN, CARL, (m) Instructor of Tactics, Gun Fire Support School, Naval Amphibian Training Unit, U. S. Naval Amphib. Base, Little Creek, Va. Home: 1932 N. Lakeland Dr., Norfolk 13, Va.

HARTMAN, DONALD H., (m) Mgr. Contract, Govt. & Ind. Div., Studebaker-Packard, 1580 E. Grand Blvd., Detroit, Mich. Home: 22120 Marlow, Oak Park, Mich.

HARTNETT, JAMES P., (m) Asst. Prof. of M. E., University of Minnesota, Minneapolis, Minn. Home: 2058 Charlton, W. St. Paul, Minn.

HARTOFILIS, STAVROS A., (s) New York University, University Hghts, Bronx, N. Y. Home: 409 W. 48th St., New York 36, N. Y.

HARVELL, JOHN T., (m) Mech. Engr., Arthur D. Little, Inc., 30 Memorial Dr., Cambridge, Mass. Home: 131 Burlingame St., Lexington, Mass.

HARVEY, HAROLD J., (m) Sr. Structural Engr., Denver Division, Glenn L. Martin Co., 1845 Sherman St., Denver 3, Colo. Home: Englewood, Colo.

HARVEY, HERBERT, (m) Vice President, Harvey Machine Co., Inc., 19200 Western Ave., Los Angeles, Calif. Home: 3301 Paseo Del Campo, Palos Verdes Estates, Calif.

HARVEY, HOMER M., (m) President, Harvey Machine Co., Inc., 19200 Western Ave., Los Angeles, Calif. Home: 4948 Ambrose St., Los Angeles, Calif.

HARVEY, I. L., (a) Service Engr., Speer Carbon Co., St. Mary's, Penna. Home: 3348 Fairway Rd., N.E., Atlanta, Ga.

HASENFUS, HAROLD J., (m) Chief, Rocket Branch, Interior Ballistics Lab., Ballistic Research Labs., Aberdeen Proving Ground, Md. Home: 627 Burkley Ave., Aberdeen, Md.

HASSEL, WILLIAM F., (m) Physicist, Rocket Research Branch, U. S. Naval Ordnance Test Station, Code 4512 Michelson Lab., China Lake, Calif. Home: 531-E Nimitz Ave., China Lake, Calif.

HASSELHORN, WALTER C., (m) President, Cook Electric Co., 2700 Southport Ave., Chicago, Ill. Home: 1625 Hinman Ave., Evanston, Ill.

HAST, DREA R., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif.

HATFIELD, C. D., (m) Field Representative, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 5110 Mission Blvd., San Diego 9, Calif.

HAUBERT, ROY A., (m) Elec. Spec., Tech. Analysis, USAF, Holloman Air Force Base, N. M. Home: 533 E. Grand, Pomona, Calif.

HAUGEN, RICHARD R., (s) Home: 5011 Wellington, Chicago 41, Ill.

HAUGHIAN, JAMES M., (s) University of California, Berkeley 4, Calif. Home: 3648 Columbian Dr., Oakland 5, Calif.

HAURLAN, PETER N., (m) Chief, Military & Industrial Engng. Division, JPL (Cal. Tech.), 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 1614 Leycross Dr., La Canada, Calif.

HAUSER, GEORGE H., (m) Vice President, Liberty Products Corporation, Motor Ave., Farmingdale, L. I., N. Y. Home: 29 Hilton Ave., Garden City, L. I., N. Y.

HAUSSMANN, HANS, (m) U.S.N.O.T.S., China Lake, Calif. Home: 278 N. Alta Vista, Monrovia, Calif.

HAUTAU, RALPH H., (a) Instructor, Design, Academy of Aeronautics, LaGuardia Field, N. Y. Home: 2339 Hudson Terrace, Coytesville, N. J.

HAVILAND, ROBERT P., (m) Flight Test Planning Engineer, Special Defense Projects Dept., General Electric Co., 2900 Campbell Ave., Schenectady, N. Y. Home: 123 Bruce St., Scotia 2, N. Y.

HAVILL, C. DEWEY, (m) Aeronautical Research Scientist, Ames Aero. Lab., NACA, Flt. Res., Moffet Field, Calif. Home: 22330 Holt Ave., Mt. View, Calif.

HAVRILIAK, ALEXANDER, (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 58-19—83 Place, Elmhurst 73, N. Y.

HAWKINS, WILLIS M., (m) Director of Engng., Missile Systems Division, Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 16125 Woodvale Rd., Encino, Calif.

HAYES, CHESTER B., (m) General Sales Manager, Gray Research & Development Co., Inc., 658 Hilliard St., Manchester, Conn., Home: Batterson Park Rd., RFD 1, New Britain, Conn.

HAYES, JOHN W., (a) Mechanical Engineer, Motorola, Inc., 8330 Indiana Ave., Riverside, Calif. Home: 3062 Cimarron Rd., Riverside, Caif.

HAYES, ROBERT R., (a) Sr. Nuclear Engr., Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 1005 Arch Adams St., Ft. Worth, Tex.

HAYMAN, RICHARD L., (m) President, Haskel Engineering & Supply Co., 1236 S. Central Ave., Glendale 4, Calif. Home: 954 Flintridge Ave., Pasadena 3, Calif.

HAYMES, WILLIAM G., (m) Design Engr., Phillips Petroleum Co., McGregor, Texas. Home: 2401 Columbus, Waco, Tex.

HAYNE, WALTER R., (m) Electronics Technician, RCA Service Co., Radio Corporation of America, Patrick Air Force Base, Fla. Home: Route 2, Box 453, Cocoa, Fla.

HAZARD, ALLYN B., (m) Propulsion Supv., FOTS, Jet Propulsion Laboratory, 4800 Oak Grove Dr., Pasadena, Calif. Home: 2843 Casitas, Altadena, Calif.

HEACOCK, ROBERT H., (c) Engr., Stress Analysis, Hughes Tool Co., Culver City, Calif. Home: 841-B Grant St., Santa Monica, Calif.

HEALD, DANIEL A., (m) Sr. Des. Engr., Missile Division, Propulsion Group, Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 3422 Waco St., San Diego 17, Calif.

HEALEY, WILLIAM J., (a) Captain, Air Operations Officer, 2585th Air Reserve Flying Center, United States Air Force, 2585th ARFC, Miami International Airport, Fla. Home: 4071 N.W. 65th Ave., Miami Springs, Fla.

HEALY, GERALD S., (s) Virginia Polytechnic Inst., Blacksburg, Va. Home: Box 171, Girard, Pa.

HEALY, ROY, (m) Senior Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 20017 Wells Dr., Woodland Hills, Calif.

HEATON, THOMAS R., (m) Sr. Proj. Engr., Advanced Design and Development, Allison Division, General oMtors Corp., Indianapolis 6, Ind. Home: 2220 Winton Ave., Speedway 24, Ind.

HECKENMUELLER, EDWARD G., (m) Assoc. Engr., Structures, Vanguard Proj., Glenn L. Martin Co., Middle River, Baltimore, Md. Home: 4117 Mary Ave., Baltimore 6, Md.

HECHT, FRIEDRICH, Professor, Department of Analytical Chemistry, University of Vienna, Wachringerstrasse 38, Wien IX., Austria. Home: Alserstrausse 69/18, Wien, VIII., Austria.

HEDBERG, JAMES H., (m) Leader-Propulsion Group, Guided Missile Division, Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 10111 Edgewood Lane, Garden Grove, Calif.

HEFFERN, ELDRED CHARLES, (m) Assoc. Engr., Engng. Division, The Rand Corp., 1700 Main St., Santa Monica, Calif. Home: 11419 Bolas St., Los Angeles 49, Calif.

HEGE, DOUGLAS W., (m) Project Engineer, North American Aviation, Inc., 6526 E. Slauson St., Los Angeles, Calif. Home: 1958 Wells Dr., Woodland Hills, Calif.

HEIMBURG, KARL L., (m) Aero. Res. Engineer, Redstone Arsenal, Huntsville, Ala. Home: 910 Locust St., Huntsville, Ala.

HEIM, DONALD J., (s) Academy of Aeronautics, LaGuardia Airport, New York, N. Y. Home: 9-02—129th St., College Point 56, N. Y.

HEIMILLER, ROBERT, (s) Member, Tech. Staff, Hughes Aircraft Co., Culver City, Calif. Home: 2711 Sepulveda, Los Angeles, Calif.

HEINEMANN, EDWARD H., (m) Chief Engineer, Douglas Aircraft Co., Inc., 827 Lapham St., El Segundo, Calif. Home: 3815 Crestway Place, Los Angeles 43, Calif.

HEINLEIN, ROBERT A., (a) Home: 1776 Mesa Avenue, Broadmoor, Colorado Springs, Colo.

HEISMANN, JAMES A., (a) Engineering Assistant, Instrumentation Unit, General Electric Co., Jimson Rd. & Wright Hwy., Cincinnati, O. Home: 8628 DeSota Dr., Cincinnati 31, O.

HEISS, FRANKLYN B., (m) Drafting Consultant, Rocket Section, Bell Aircraft Corp., Box 1, Buffalo 5, N. Y. Home: 385 McKinley Ave., Kenmore 23, N. Y.

HEIT, JOHN G., (m) Sr. Field Engr., Service Engng., Convair, A Div. of General Dynamics Corp., Ft. Worth, Tex. Home: 5064 Gilbert Dr., Ft. Worth, Tex.

HEITHECKER, HEINRICH A., (m) Mechnical Engr. (Structures), Holloman Air Development Center, Holloman, N. M. Home: 1907 Moor Place, Alamogordo, N. M.

HELBERT, WILLIAM B., JR., (m) Branch Chief, Production Control Branch, Radford Arsenal (Ordnance Corps), Radford, Va. Home: Martinique Apts., Radford, Va

HELDACK, JOHN M., (m) Manager, Aircraft and Weapons Systems, Aviation & Defense Industries Sales Department, General Electric Company, 212 North Vignes St., Los Angeles 54, Calif. Home: 4924 Coliseum St., Los Angeles 16, Calif.

HELFAND, FREDRIC E., (s) Engng. Draftsman, Engng., Republic Aviation Corp., Farmingdale, L. I., Home 158—21 28 Ave., Flushing 58, N. Y.

HELFRICH, JAMES F., (m) Sr. Electronics Engr., Guided Missile Division, Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles, Calif. Home: 13027 Clark St., Downey, Calif.

HELLEBRAND, EMIL A. H., (m) Aeronautical Dev. Eng., Redstone Arsenal, Huntsville, Ala. Home: 904 Sandlin St., Huntsville, Ala.

HELLER, DOUGLAS M., (m) Director of Engng., Bendix Products Div., Missile Plant, Bendix Aviation Corporation, 400 S. Beiger St., Mishawaka, Ind. Home: 2005 N. Ironwood Dr., So. Bend 15, Ind.

HELLER, GERHARD B., (m) Res. & Dev. Engr., Army Ballistic Missile Agency, Redstone Arsenal, Huntsville, Ala. Home: 300 E. Bob Wallace Ave., Huntsville, Ala.

HELLER, JOHN H., (m) Executive Director, New England Institute for Medical Research, Grove St., Ridgefield, Conn. Home: Dudley Rd., Wilton, Conn.

HELLER, KENNETH G., (m) Project Leader, Research Department, Detroit Controls Corporation, 1650 Broadway, Redwood City, Calif. Home: 1115 Woodside Rd., Redwood City, Calif.

HELLER, WILLIAM, (m) Development Engr., Liquid Engine Division, Aerojet-General Corp., Irwindale Ave., Azusa, Calif. Home: 1017 N. Orange Ave., Azusa, Calif.

HELLQUIST, GEORGE A., (a) Employment Supervisor, Associated Engineers, Inc., P. O. Box 1628, Springfield, Mass. Home: 268 S. Westfield St., Feeding Hills, Mass.

HELSTROM, GILBERT R., (m) Electronic Tchnician "A", Internal Measurement (Telemetry), Land-Air, Inc., Holloman AFB, Alamogordo, N. M. Home: 1304—19th St., Alamogordo, N. M.

HEMPEL, ROY A., (a) Proj. Engr., Product Design, Brush Electronics Co., 3631 Perkins, Cleveland 14, O. Home: 3606 W. 60th Place, Cleveland 2, O.

HEMSLEY, RICHARD T., (m) Lt. Col. U.S.A.F. Home: 1609 Park Grove Ave., Baltimore 28, Md.

HENDERSON, DAVID M., (s) University of Wichita, Wichita, Kan. Home: 719 Sylvan Lane, Wichita 18, Kan.

HENDERSON, GEORGE A., (m) Chief, Reliability Branch, Proj. Management Staff, Redstone Arsenal, Huntsville, Ala. Home: 910 Hermitage St., Huntsville, Ala.

HENDREN, EUGENE E., (m) Member Technical Staff, Rocket Motor Development Section, Hughes Aircraft Co., Florence & Teale Sts., Culver City, Calif. Home: 3962 McLaughlin, Los Angeles 66, Calif.

HENDRICKS, ROBERT C., (s) Ohio State University, 92 W. Frambes Ave., Columbus 1, O. Home: 738 Mineral Sp. Ave., Youngstown 11, O.

HENKE, EDMUND J., (m) President and Research Dir., American Electric Fusion Corp., 2600 Diversey Ave., Chicago 47, Ill.

HENLEY, ROBERT R., (m) Supervisor, Industrial Engng., North American Aviation, Inc., Intl. Airport, Los Angeles, Calif. Home: 7730 Rindge, Playa Del Rey, Calif.

HENNESEY, HAL M., (a) Editorial Director, Weider Publications, Inc., 13 Abbey Lane, Levittown, N. Y.

HENNIGH, KEITH E., (m) Physical Science Laboratory, State College, N. M. Home: P. O. Box 1135, State College, N. M.

HENRICKS, WILLIAM, (m) Senior Engineer, Mechanical Design, Cook Research, 8100 Monticello Ave., Skokie, Ill. Home: 5046 N. Winchester, Chicago 40, Ill.

HENRY, STACEY C., (m) Prop. Res. Mechanic, North American Aviation, Inc., Aerophysics Lab., Santa Susana, Calif. Home: 126 Redwood Ave., Redwood City, Calif.

HENSLEY, MAURICE L., (m) Mechanical Engr., Engng. Div., USAF, Holloman Air Dev. Center, Holloman, N. M. Home: 417 Arnold Lane, Alamogordo, N. M.

HENZE, HARRY, (m) Assistant Senior Engineer, Proving Grounds, Aerojet-General Corp., Azusa, Calif. Home: 612 Manzanita, Sierra Madre, Calif.

HEPBURN, RICHARD L., (a) 2d Lt. USAF, Flying Training Command, Lackland AFB, San Antonio, Tex. Home: 3049 E. Rickie Vista, Tucson, Ariz.

HEPKEMA, ROBERT L., (m) Design Engineer, Liquid Engine Div., Aerojet-General Corp., 6352 N. Irwindale Ave., Azusa, Calif. Home: 19315 E. Swanee Lane, Covina, Calif.

HERALD, PAUL D., (s) Indiana Tech. College, 623 Washington Ave., Ft. Wayne, Ind. Home: 6810 Bluffton Rd., Ft. Wayne, Ind.

HERBERT, JOHN T., JR., (m) Electronic Engr., Missile Test Project, RCA Service Co., Patrick Air Force Base, Fla. Home: Box 271, Merritt Island, Fla.

HERMAN, GEORGE R., (m) Electrical Engr., Research Dept., Chicago Bridge & Iron Co., 1035 W. 105th St., Chicago 43, Ill. Home: 1322 W. 97th Place, Chicago 43, Ill.

HERNDON, L. KERMIT, (m) Technical Director, Aviation Division, Olin Mathieson Chemical Corporation, Box 480, Niagara Falls, N. Y. Home: 2303 Onandaga Dr., Columbus, O.

HERRICK, JOHN W., (m) Home: P.O. Box 45, Downey, Calif.

HERRMANN, CHARLES R., (m) Superv. Rocket Design Engr., Engng. & Devel. Branch, U. S. Naval Ordnance Test Station, China Lake, Calif. Home: 525-A Nimitz Ave., China Lake, Calif.

HERTY, CHARLES H. III, (m) Chemist, Phillips Petroleum Co., McGregor, Tex. Home: 2109 Richter St., Waco, Tex.

HERUD, FRANK R., (m) Engineer, Curtiss-Wright Corp., Caldwell, N. J. Home: 7 Western Ave., Chatham, N. J.

HESELTON, ROBERT G., (a) Electrical Draftsman, Refinery Division, Bechtel Corporation, 62 First St., San Francisco, Calif. Home: 1265 DeHaro St., San Francisco 10, Calif.

HESS, ANTON, (a) Design Engineer, Thompson Products, 23255 Euclid St., Euclid 17, O. Home: 3322 Fortune Ave., Parma 29, O.

HESS, FREDERICK W., (m) Director of Customer Relations, Weapon Systems Development Laboratories, Hughes Aircraft Co., Florence & Teale St., Culver City, Calif. Home: 7514 Whitelock Ave., Playa del Rey, Calif.

HESTER, J. G., (m) Proj. Mgr., Consolidated Western Steel Div., United States Steel, P. O. Box 2015 Terminal Annex, Los Angeles, Calif. Home: 121 E. Pine, Alhambra, Calif.

HETT, JOHN H., (m) President, Hett Associates, Inc., 603 Grand Ave., Englewood, N. J.

HETTRICK, GEORGE W., (m) Research Engr., Boeing Airplane Co., Seattle, Wash. Home 19602 Marine View Dr., Seattle 66, Wash.

HEUBUSCH, HENRY P., (m) Assist. Propellants and Materials Group Leader, Rocket Department, Bell Aircraft Corporation, P. O. Box #1, Buffalo 5, N. Y. Home: 166 Cedar Rd., Buffalo 15, N. Y.

HEWITT, E. E., (a) Chief Engr., Industrial Products Division, Westinghouse Air Brake Co., Wilmerding, Pa. Home: R. D. 1, Ruffs Dale, Pa.

HEWITT, GEORGE F., (m) Res. Engr., Experimental Development Group, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 21816 Dumetz Rd., Woodland Hills, Calif.

HEWITT, HARVEY G., (a) Civil Engineer, International Engineering Co., Inc., 74 New Montgomery St., San Francisco 5, Calif. Home: 415 Hiller St., Belmont, Calif.

HICKERSON, FREDERICK R., (m) Project Engineer, U. S. Naval Air Rocket Test Station, Lake Denmark, Dover, N. J. Home: Box 321, R. D. 3, Newton, N. J.

HICKS, HENRY A., JR., (m) Assoc. Res. Engineer, University of Michigan Engineering Res. Inst., Ann Arbor, Michigan. Home: 1190 Hull Ave., Ypsilanti, Mich.

HEILSCHER, HENRY, (m) Laboratory Supv., White Sands Proving Grounds, N. M. Home: 328 George Orr Rd., El Paso, Tex.

HIESTER, NEVIN K., (m) Manager, Chemical Engng. Section, Chemistry Department, Stanford Research Institute, Menlo Park, Calif. Home: 267 Catalpa Dr., Atherton, Calif.

HIGGINS, WILLIAM H. C., (m) Director of Military Electronics Development, Bell Telephone Laboratories, Whippany, N. J. Home: 389 Wyoming Ave., Maplewood, N. J.

HIGGINSON, JOHN, (m) General Manager, Elkton Division, Thiokol Chemical Corp., Elkton, Md. Home: 705 Chrysler Ave., Newark, Del.

HIKITA, TSUTOMU, (m) Professor, Faculty of Engineering, University of Tokyo, Bunkyo-ku, Tokyo, Japan.

HILDEBRANDT, JOSEPH H., (s) Home: 46-01 31st Ave., Long Island City 3, N. Y.

HILL, BENTLEY G., (m) Chief, Missiles Weight Section, Engng. Dept., Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 440-23 St., Santa Monica, Calif.

HILL, EUGENE F., (m) Manager, Chemistry Department, Scientific Laboratory, Engineering Staff, Ford Motor Company, 21500 Oakwood Blvd., Dearborn, Mich. Home: 24320 Edgemont, Birmingham, Mich.

HILL, FOSDICK E., (m) Res. Engr., Boeing Airplane Co., Bldg. 800, Patrick Air Force Base, Fla. Home: 416 Melbourne Ave., Indialantic, Melbourne, Fla.

HILL, ROBERT B., (m) President, Glar-Ban Corp., 2241 Elmwood, Buffalo 23, N. Y. Home 319 Vandervoort, N. Tonawanda, N. Y.

HILLIARD, FREDERICK E. R. D., (m) Research Assistant, Forrestal Research Center, Princeton University, Princeton, N. J. Home: 218-A Marshall St., Princeton, N. J.

HILTZ, WILLIAM F., Electronic Eng. Aerophysics Dept., Goodyear Aircraft Corp., Massillon Rd., Akron, Ohio. Home: 3610 Adaline Dr., Stow, O.

HINCHEY, FRED A., (m) Program Plans Coordinator, Integrated Range Mission, WSPG, New Mex. Home: 660 La Cruz Lane, Las Cruces, New Mex.

HINCHEY, JOHN B., (m) Engr. General, A.M.C. Liaison Office, Rocket Engine Test Lab., Edwards, Calif. Home: 44656 N. Tenth St., W. Lancaster, Calif.

HINCKLEY, FRANCIS F., (a) Engineer, Redstone Arsenal, Huntsville, Ala. Home: 37 Polk Dr., Huntsville, Ala.

HINDIN, HARVEY J., (s) Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y. Home: 1683 42nd St., Brooklyn, N. Y.

HINGSTON, WILLIAM E., (a) Home: 7734 Etiwanda Av., Reseda, Calif.

HINKS, WILLIAM L., (m) Sr. Development Engr., Aerophysics Dept., Goodyear Aircraft Corp., Massillon Rd., Akron 15, O. Home: 1079 Washington, Cuyahoga Falls, O.

HINMON, DON ., (m) Vice-President & General Mgr., Industrial Insulation Division, Johns-Manville, 22 E. 40th St., N. Y. C. Home: 55 Hathaway Lane, White Plains, N. Y.

HIRSCH, ROBERT L., (m) Sr. Engineer, Aerojet-General Corp., Irwindale Rd., Azusa, Calif. Home: 34 W. Forest Ave., Arcadia, Calif.

HIRSCHKRON, ROBERT, (s) Princeton University, Princeton, N. J. Home: 214 B. Halsey St., Princeton, N. J.

HITCHCOCK, ELLWOOD T., (m) Supervisor of Quality Engng., Quality Assurance, Aerojet-General, Azusa, Calif. Home: 426 Doyle Dr., San Gabriel, Calif.

HITCHENS, A. L., (m) North American Aviation Co., Downey, Calif. Home: 1854- Dearborn St., North Ridge, Calif.

HITE, WALTER A., (m) Chief, Missile Projects Section, Engineering Division, Ryan Aeronautical Co., Lindbergh Field, San Diego, Calif. Home: Tecate Ranch, Tecate, Calif.

HOBBS, MARVIN, (m) Director of Marketing, American Machine & Foundry Co., 1085 Commonwealth Ave., Boston, Mass. Home: 606 Woodstock Rd., Southbridge, Mass.

HODGE, JOHN D., JR., (s) Lab. Technician, White Sands Proving Grounds, Las Cruces. N. M. Home: Box 657, State College, N. M.

HODGES, ROY A., (m) Engr., Beech Aircraft Corp., 9709 E. Central, Wichita, Kan. Home: 1032 N. Edgemoor, Wichita, Kan.

HODGSON, R. W., Director of Research & Development, Research Dept., R. W. Hodgson Co., 3406 W. Washington Blvd., Los Angeles 18, Calif.

HOEDEN, ALFRED VANDER (a) Commander, Royal Netherlands Navy, Ass't Naval Attache, Netherlands Embassy, 1470 Euclid St., Washington, D. C. Home: 5901 Kensington Pkwy., Chevy Chase, Md.

HOERCHER, HENRY ERHARDT, (m) Associate Scientist, Advanced Development Division, Avco Mfg. Corp., 155 Sniffen's Lane, Stratford, Conn. Home: 6718 60th St., Brooklyn 27, N. Y.

HOEY, JAMES K., (m) Capt. Ord. C, Ordnance Mission, U. S. Army, White Sands PG, N. Mex. Home: 508 F. St., White Sands PG, N. Mex.

HOFFMAN, AUSTIN J., (s) Stevens Inst. of Technology, Hoboken, N. J. Home: 295 So. 6th St., Newark 3, N. J.

HOFFMAN, FRANK E., Mgr., West Coast Aircraft Sales & Engng., Kelsey-Hayes Wheel Co., 2665 Leonis Blvd., Los Angeles 58, Calif. Home: 4641 Hampton Rd., La Canada, Calif.

HOFFMAN, JOSEPH C., (m) Manager, Product Information, Special Defense Projects, General Electric Co., 2900 Campbell Ave., Schenectady 8, N. Y. Home: 1360 Belmont Ave., Schenectady 8, N. Y.

HOFFMAN, SAMUEL K., (m) General Manager, Rocketdyne, A Division of North American Aviation, Inc., Canoga Ave., Canoga Park, Calif. Home: 5432 Wilbur Ave., Tarzana, Calif.

HOFFMAN, THELMA, (m) Design Checking, Goodyear Aircraft Corp., Massillon Rd., Akron, O. Home: 666 No. Howard St., Akron 10, O.

HOFFMAN, WILLARD A., (m) Senior Engineer, Missile Flight Test, Missile Development Division, North American Aviaton, Inc., Downey, Calf. Home: 16439 Prudencia Dr., Whittier, Calif.

HOFSTEIN, LAWRENCE L., (m) Group Leader, Mach. Integration, Talos Laboratory, Amer. Mach. & Fdry. Co., 11 Bruce Place, Greenwich, Conn. Home: 414 Spruce Lane, E. Meadow, N. Y.

HOGAN, ORIEN L., (m) Engineering Rep.—Rocket Engines, North American Aviation, Inc., 6349 E. Slauson Ave., Maywood, Calif. Home: 731 No. Main St., La Habra, Calif.

HOLBROCK, EDWARD F., (a) Jr. Engineer, Engineering, Herring-Hall-Marvin Safe Co., Grand Blvd., Hamilton, O. Home: 908 Campbell Ave., Hamilton, O.

HOLCOMB, DON C., (m) Sr. Engr., Test and Field Service, Aerojet-General Corp., Box 296, Azusa, Calif. Home: 1015 Crestview Dr., Pasadena, Calif.

HOLCOMB, SANFORD P., (m) Assist. Manager, Nehi Products, 390 Safford St., Fresno, Calif. Home: 390 Safford St., Fresno, Calif.

HOLDEN, WILLIAM H. T., (m) Consulting Elec. Engineer, 2042 Crary St., Pasadena 7, Calif.

HOLDERNESS, EUGENE R., (m) Devel. Chemist, Propellant Development, Aerojet-General Corp., Azusa, Calif. Home: 1174 North Mentor, Pasadena, Calif.

HOLL, RICHARD M., (s) Indiana Technical College, 221 East Washington, Fort Wayne, Ind. Home: 131 East Creighton, Fort Wayne, Ind.

HOLLAND, KENNETH DELEVAL, JR., (m) Mech. Engineer, Douglas Aircraft Co., 3000 Ocean Pk. Blvd., Santa Monica, Calif. Home: 114 Cote St., Boron, Calif.

HOLLEY, HERSCHEL Q., Propellant Plant Mgr., Propellant Plant Department, Thiokol Chemical Corporation, Longhorn Division, Marshall, Tex. Home: 1204 Washington Place East, Marshall, Tex.

HOLLOWAY, DAN M., (a) Sales Engineer, Midwestern Instruments, 3401 So. Harvard St., Tulsa, Okla. Home: 3707 E. 29th St., Tulsa, Okla.

HOLLOWAY, RICHARD B., Associate Engineer, Aerodynamics Staff, Wichita Div., Boeing Airplane Co., 3801 So. Oliver, Wichita 1, Kan. Home: 1725 Fairmount, Wichita 14, Kan.

HOLMES, ALFRED F., (m) Sr. Lab. Supervisor, Flobac Div., Boeing Airplane Co., Box 97, Melbourne, Fla. Home: Box 1361, Cocoa, Fla.

HOLMES, WILLIAM C., JR., (m) Chief, Power Plant Eng. Dept., Northrop Aircraft, Inc., Hawthorne, Calif. Home: 2128 Chelsea Rd., Palos Verdes Estates, Calif.

HOLSTON, ROBERT E., (s) Drexel Institute of Technology, 32nd & Chestnut Sts., Philadelphia 4, Pa. Home: 818 So. 51st St., Philadelphia 43, Pa.

HOLT, OSCAR E., (m) Assistant Plant Manager, Old Forge Plant, The W. L. Maxson Corp., Old Forge, Pa. Home: 120 Park Dr., Clarks Summit, Pa.

HOLWAY, JAMES M., (a) Lt. Jg., UNNR, Assist. Fire Cont. Officer, Fire Control Div., NGMU-22, USN, White Sands Proving Grounds, NGMU-22, WSPG, Las Cruces, N. M. Home: Qtrs., WSPG, Las Cruces, N. M.

HOLWERDA, MARTEN A., (m) Home: 6785 Ave. Decelles, Apt. 1, Montreal, Canada

HOLZMAN, DAVID, (m) Development Engr. "A", Dept. 240, Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 2219 Virginia, Pomona, Calif.

HOLZL, ROBERT A., (m) Chief Development Eng., American Machine & Foundry Co., Pacoima, Calif. Home: 468 Paulette Pl., La Canada, Calif.

HOM, STEPHEN, (m) Field Engr., Heavy Military Electronic Equipment, General Electric Company, Electronics Park, Syracuse, N. Y. Home: 1370 Washington St., San Francisco 9, Calif.

HOOD, HERSHEL O., (s) University of Cincinnati, Cincinnati 20, O. Home: 1023 Main, Massillon, O.

HOOD, WILLIAM J., (m) Engineer, Coleman Engineering Company, Inc., 6040 W. Jefferson, Los Angeles, Calif. 124½ Marine Ave., Manhattan Beach, Calif.

HOOK, DONALD W., (s) Purdue University, W. Lafayette, Ind. Home: 1701 Rainey St., Lafayette, Ind.

HOOKS, DANIEL E., (m) Brigadier General, USAF. Home: 2509 N. Upland St., Arlington 7, Va.

HOPKINS, BERNE H., (m) Design Engineer, Aerojet-General Corp., Azusa, Calif. Home: 426 Houser Dr., Covina, Calif.

HORAN, JOHN J., Test Engr., Heat Exchanger Group, Pratt & Whitney Aircraft Corp., 400 Main St., East Hartford, Conn. Home: 561 Zion St., Hartford 6, Conn.

HORN, HELMUT J., (m) Physicist, Analog. Simulation Sect., Flight Sim. Br., EML, White Sands Proving Ground, N. M. Home: 301 4th Ave., White Sands P. G., N. M.

HORNE, CHARLES F., (m) Division Manager, Convair, A Division of General Dynamics Corporation, P.O. Box 1011, Pomona, Calif. Home: 844 Hillcrest Dr., Pomona, Calif.

HORNE, HARRY B., JR., (m) Assist. to Vice-Pres., Administration, Vertol Aircraft Corp., Morton, Pa. Home: 1317 Colton Rd., Gladwyne, Pa.

HORNER, JOHN W., (m) Preliminary Design, Rocket Coordinator, Missile Development Division, North American Aviation, Inc., Downey, Calif. Home: 8935 Valley View Ave., Whittier, Calif.

HORNING, THOMAS D., (m) Engr., Telemetry Section, Bendix Aviation Corp. Pacific Div., 11600 Sherman Way, No. Hollywood, Calif. Home: 11942 Hart St., Apt. 3, No. Hollywood, Calif.

HORR, RAYMOND W., (m) Senior Engineer, Research, Military Operations Analysis Group, Preliminary Design Section, North American Aviation, Inc., 4300 E. 5th Ave., Columbus 13, O. Home: 195 N. Broadleigh Rd., Columbus 13, O.

HORSWILL, JAMES W., (s) University of Minn. Home: 2815 W. 45th St., Minneapolis 10, Minn.

HOSIER, C. W., JR., (m) Assist. Director of Sales, Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 1838 El Vista Circle, Arcadia, Calif.

HOUGH, RICHARD R., (m) Dir. of Military Systems Dev., Bell Telephone Laboratories, Inc., Whippany Rd., Whippany, N. J. Home: 2 Highland Ave., Madison, N. J.

HOUGHTON, CHARLES P., (m) Aircraft Designer, Douglas Aircraft Co., Inc., 827 Lapham St., El Segundo, Calif. Home: 424 14th St., Santa Monica, Calif.

HOULT, CHARLES H., (m) President, United Sash & Door Co., [illegible]15 Wheeler Ave., Wichita 12, Kan. Home: 13602 East Central St., Wichita 15, Kan.

HOUPT, FRANK P., (m) Application Engr., Sales, Fischer and Porter Co., County Line Rd., Hatboro, Penna. Home: Huntington Rd., Hatboro, R.D., Penna.

HOUSE, JAMES P., (m) Electronics Des. Engr., Engng. Dept. 64, Convair, A Division of General Dynamics Corp., Grant's Lane, Ft. Worth, Tex. Home: 6164-A Karen Circle, Ft. Worth 16, Tex.

HOUSE, WILLIAM C., (m) Prin. Engr. Study Dept., Aerojet-General Corp., Azusa, Calif. Home: 1695 Wagner St., Pasadena, Calif.

HOUSTON, COLIN ALEXANDER, (m) Sr. Technologist, Market Devel. Dept., Shell Chemical Corp., 50 W. 50th St., New York 20, N. Y. Home: Old White Plains Rd., Mamaroneck, N. Y.

HOVLAND, HENRY H., (m) Eng. Rep., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Park, Canoga Park, Calif.

HOWARD, DUANE W., (m) Res. Engr., Boeing Airplane Co., Wichita, Kan. Home: 1313 Gow St., Wichita, Kan.

HOWARD, JOHN R., Special Assignment Engineer, AC Spark Plug Div., General Motors, 1925 E. Kenilworth Pl., Milwaukee, Wis. Home: 808 E. Bradley Rd., Fox Point 17, Wis.

HOWARD, ROBERT W., Project Officer, Matador Test Team, Air Force Operational Test Center (APGC), USAF, Box 262, Patrick AFB, Fla. Home: 202 4th Ave., Indialantic, Melbourne, Fla.

HOZAKI, SHIGEMI, (m) Aerodynamicist, Thermodynamic Group, Propulsion Research Corp., 1860 Franklin St., Santa Monica, Calif. Home: 886 N. Fair Oaks, Pasadena, Calif.

HUDSON, COLIN M., (m) Tech. Assist. to Chief, Rock. Br., Research Dev. Div., Dept. of Army, Washington 25, D. C. Home: 6415 N. Washington Blvd., Arlington 5, Va.

HUDSON, KENNETH, (m) Section Head, Engrg. Dept., Gov't Mfg. Div., Allen B. DuMont Labs., Inc., 35 Market St., Paterson, N. J. Home: 145 Busted Dr., Midland Park, N. J.

HUEBNER, ALBERT L. C., (s) Columbia University, Pupin Laboratories, Columbia Univ., New York, N. Y. Home: 743 Badford St., Brooklyn 7, N. Y.

HUETER, HANS, (m) Chief, Launching & Handling Equip. Lab., Army Ballistic Miss. Agency, Redstone Arsenal, Huntsville, Ala. Home: 906 Locust St., Huntsville, Ala.

HUFF, VEARL N., (m) Head—Rocket Thermodynamics Sec., Nat. Advisory Committee for Aeronautics, 21000 Brook Park, Cleveland, O. Home: 23493 Marion Rd., Fairview Park 26, O.

HUFFMAN, KENAZ, JR., (m) Contract Administrator, Contract Administration, Douglas Aircraft Co. Inc., 3000 Ocean Park, Santa Monica, Calif. Home: 10231 Collett Ave., Granada Hills, Calif.

HUGHEN, WILLIAM E., (m) Chief Chemist, Chemical Branch, Holloman Air Development & Center, Engineering Services Lab., Alamogordo, N. M. Home: 1905 Rutz Circle, Alamogordo, N. M.

HUGHES, JAMES J., (m) Missiles Power Plant Engineer, Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 2219 14th St., Santa Monica, Calif.

HUGHES, RONALD D., (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: 3125 Nickel St., Los Alamos, N. M.

HULL, EDWIN H., (f) Research Associate, Research Services Div., General Electric Co., P.O. Box 1088, Schenectady, N. Y. Home: 226 Ballston Ave., Scotia 2, N. Y.

HULL, JAMES R., (m) Des. Engr., Rocket Eng., Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 7342 Charbono Way, Rancho Cordova, Calif.

HUME, JAMES P., (m) Sr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: Box 161, North Ridge, Calif.

HUMPHREY, JACK, (m) Res. Scientist, Rocket Branch, NACA, Cleveland, O. Home: 5840 W. 215, Parkview 26, O.

HUNKLER, L. THOMAS, (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: 402 W. DeWald St., Fort Wayne, Ind.

HUNT, HAROLD E., (s) Indiana Tech. College, Ft. Wayne, Ind. Home: RR. #1, Box 76, Huntington, Ind.

HUNTER, BRYAN J., (m) Electronic Specialist, Range Instrumentation Div., White Sands Sig. Corp Agency, WSPG, N. Mex. Home: 1511 Boutz Rd., Las Cruces, N. Mex.

HUNTER, G. TRUMAN, (m) International Business Machines Corp., 363—3d St., Cambridge, Mass. Home: 381 Bergen Blvd., Oradell, N. J.

HUNTER, MAXWELL W., (m) Missiles Design Engr., Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 4701 Aqueduct Ave., Encino, Calif.

HURST, WILLIAM F., (am) Electronic Engineer—Quality Assurance, Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 11472 Caroleen Lane, Anaheim, Calif.

HUSE, ALFRED KARL, (m) Staff Assist. to Area Mgr., on Nuclear Reactors, USAEC, NYOO, Brookhaven Area. Home: 53 Bell Ave., Upton, L. I., N. Y.

HUSON, GEORGE R., (m) Development Engineer, Thrust Chamber Department, Reaction Motors Inc., Denville, N. J. Home: 81 W. Lakeshore Dr., White Meadow Lake, Rockaway, N. J.

HUSON, JOHN, (m) Aviation Requirements, Head, Guided Missiles, U. S. Navy, O.N.R. Spec. Devices Center, Port Washington, L. I., N. Y. Home: Fernwood Ave., Oakdale, L. I., N. Y.

HUTMACHER, EUGENE S., (m) Supv., Equipment Engng., North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 22458 MacFarlane, Woodland Hills, Calif.

HUTTON, R. B., (m) Vice President, Sales, Leach Corporation, 5915 Avalon Blvd., Los Angeles, Calif. Home: 2548 Hutton Dr., Beverly Hills, Calif.

HUZEL, DIETER K., (m) Supervisor, Design & Development, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 6962 Donna Ave., Reseda, Calif.

HUZZEN, CARL, (s) University of Rochester, Rochester, N. Y. Home: 10 Greenwood St., Rochester 8, N. Y.

I

IBELE, WARREN E., (m) Asst. Prof., Mech. Engng. Dept., Univ. of Minnesota, Minneapolis, Minn. Home: 1050—15 Ave. S.E., Minneapolis, Minn.

IGNATIUS, WM. R., (m) General Manager, Longhorn Division, Thiokol Chemical Corp., Marshall, Tex. Home: Brownrigg Ave., Marshall, Tex.

ILIJIC, THOMAS A., (s) Academy of Aeronautics, LaGuardia Airport, Flushing 71, N. Y. Home: 50-38—39th Place, Long Island City, 4, N. Y.

INGER, GEORGE R., (s) Instructor, Dept. of Aeronautical Engineering, Wayne University, 664 Putnam Ave., Detroit 2, Mich. Home: 4310 Bishop Ave., Detroit 24, Mich.

INGHAM, KENNETH R., (s) Home: 169 Brookline St., Cambridge, Mass.

INGHAM, KENNETH T., (m) Supervisor, Turbo Mach. Design, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 8048 Zelzah Ave., Reseda, Calif.

INGEBO, ROBERT D., Aero. Res. Scientist, Fuels and Combustion Division, NACA, 21000 Brookpark Road, Cleveland 11, O. Home: 7036 Oakwood Road, Cleveland 30, O.

INOUYE, KAORU, (m) Process Control Chemist, Aerojet-General Corp., Box 296, Azusa, Calif. Home: 120 E. Evergreen Ave., Monrovia, Calif.

IRGON, JOSEPH, (m) Chief Analyst, Engineering & Research Division, Reaction Motors, Inc., Denville, N. J. Home: 97 Kendall Ct., Dover, N. J.

IRVIN, LESLIE L., (m) President, Irving Air Chute Co., Inc., 1315 Versailles Rd., Lexington, Ky. Home: 800 Nimes Rd., Los Angeles 24, Calif.

ISBELL, BILLY S., (m) Aeronautical Power Plant Development Engr., Guided Missile Development Division, U. S. Army Ordnance, Redstone Arsenal, Huntsville, Ala. Home: 800 Randolph, Huntsville, Ala.

ISBELL, EVERETT C. JR., (m) Designer, Missiles Division A-260, Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 12746 Rose Ave., Los Angeles 66, Calif.

ITOKAWA, HIDEO H. I., (am) Prof., Inst. of Industrial Science, University of Tokyo, Chiba, Japan. Home: 1077 Matsubaya, Setagaya, Tokyo, Japan.

IVAN, JOSEPH M., (m) Design Engr., Kirk Engineering Co., 1776 S. Robertson Blvd., Arcadia, Calif. Home: 1023 Rancho Road, Arcadia, Calif.

IVANOVIC, NICHOLAS P., (m) Supervisor, Naval Aircraft Factory, Naval Base, Bldg. 75, Philadelphia 12, Pa. Home: 6342 Leonard St., Philadelphia 49, Pa.

IVES, GEORGE M., (m) Member Technical Staff, Guided Missile Research Div., Ramo-Wooldridge Corp., 8820 Bellanca, Los Angeles 45, Calif. Home: 5530 Via Del Valle, Torrance, Calif.

IVORY, JOHN F., (s) American International College. Home: 693 Carew St., Springfield, Mass.

J

JACKSON, ELBERT G., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8956 Rathburn, Northridge, Calif.

JACKSON, ROY, (m) Farnsworth Electronics Co., Ft. Wayne, Ind. Home: 530 W. Berry St., Ft. Wayne, Ind.

JACOBI, WILLIAM M., (m) Research Assoc., Chem. Eng. Dept., Syracuse University, Syracuse 10, N. Y. Home: Apt. 4, 1401 Maple Dr., Pittsburgh 27, Pa.

JACOBS, DONALD B., 1st Lt., (m) Project Officer, Rocket Section, Air Force Armament Center, Eglin AFB, Fla. Home: 178—26th N. Seattle 2, Wash.

JACOBS, FRANK, JR., (m) Res. Engr., Metallurgy, Engng. Dept., Boeing Airplane Co. Wichita Div., Wichita, Kan. Home: 2130 S. Pinecrest, Wichita, Kan.

JACOBS, IRVING V., (m) Rocket Powerplant Tech., Bell Aircraft Corp., P.O. Box 391, Holloman AFB, N. M. Home: 901 Dexter Lane, Alamogordo, N. M.

JACOBS, KENNETH HENRY, (m) Assoc. Chief Engr., Engng. Division, Chicago Midway Laboratories, 6220 S. Drexel, Chicago, Ill. Home: 921 Cambridge Lane, Wilmette, Ill.

JACOBSON, HOWARD F., (a) Deputy Division Mgr., Logistic Oper., Executive Dept., Pan American World Airways, OMU #308, PAFB, Fla. Home: 1903 N. Indian River Dr., Cocoa, Fla.

JACOBSON, JOEL M., (m) Vice Pres. & Gen. Mgr., Aircraft Armaments, Inc., Cockeysville, Md. Home: 4 Sudbrook Court, Pikesville 8, Md.

JACOBSON, OLIVER H., (m) Thermodynamicist, Pastushin Aviation Corp., 5651 W. Century Blvd., Los Angeles 45, Calif. Home: 10249 Fourth Ave., Inglewood 4, Calif.

JAENKE, MARTIN G., (m) Supervisory Electronic Scientist, Tech. Analysis Div., Holloman Air Development Center, Holloman A.F.B., New Mex. Home: 308 Arnold Lane, Almogordo, N. M.

JAHN, RAYMOND F., (m) President and General Mgr., Ford Instrument Company, Division of Sperry Rand Corporation, 31-10 Thomson Ave., Long Island City 1, N. Y. Home: 20 Sutton Place South, New York 22, N. Y.

JAMES, GEORGE S., (m) Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: P. O. Box 199, El Dorado, Calif.

JANES, CHESTERFIELD H., JR., (s) Purdue University, Lafayette, Ind. Home: P. O. Box 484, Melrose, Fla.

JANOVSKY, ROBERT E., (s) Academy of Aeronautics, LaGuardia Airport, Flushing, N. Y. Home: 351 Peninsula Blvd., Lynbrook, N. Y.

JANSEN, HOWARD J., (m) Rocket Installation Group Leader, Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 216 Traverse Blvd., Kenmore 17, N. Y.

JANSSON, JOHN H., (a) Turbine Installation Supv. Engr., General Electric Co., 744 Broad St., Newark 2, N. J. Home: 692 Larch Ave., Teaneck, N. J.

JAROS, ZYGMUNT, (m) Defense Products Mgr., Atomic Energy Div., American Machine & Foundry Co., 261 Madison Ave., New York 16, N. Y. Home: 4207—34th Ave., Long Island City 1, N. Y.

JASINSKI, RICHARD B., (s) Parks College, E. St. Louis, Ill. Home: 480 Oliver St., N. Tonawanda, N. Y.

JAZWIEC, EARL A., (a) U.S.A.F. Quality Control Div., Hughes Aircraft Co., Florence & Teale, Culver City, Calif. Home: 531 N. Paulina Ave., Redondo Beach, Calif.

JEFFERSON, KAY D., 1st Lt. (a) USAF, Res. Administrator, Office for Advanced Studies, Air Force Office of Scientific Research, Air Research and Development Command, USAF, 29 South Grand Ave., Pasadena, Calif. Home: P. O. Box 2035-D, 1130 North Monterey St., Alhambra, Calif.

JEFFRIES, ROBERT RICHARD, (m) Aerodynamics Engr., Beech Aircraft Corp., Wichita, Kan. Home: 8333 E. Gilbert, Wichita, Kan.

JENKINS, H. POWELL, JR., (m) Head, Rocket Res. Branch, U. S. Naval Ordnance Test Station, China Lake, Calif. Home: 106-A Byrnes St., China Lake, Calif.

JENKINS, ORIN D., (a) Instrumentation Tech., Aerojet-General Corporation, Azusa, Calif. Home: 1002 Sibley, P.O. Box 134, Folsum, Calif.

JENNINGS, FREDERICK A., (m) Research Eng., North American Aviation, Inc., 6329 E. Slauson St., Los Angeles 22, Calif. Home: 1025 E. Union St., Fullerton, Calif.

JENSEN, GUNNAR S., (s) Mid'n. 1/C., U. S. Navy, Rm. 4005 U. S. Naval Academy, Annapolis, Md. Home: 99 E. 14th St., Chicago Heights, Ill.

JENSEN, JORGEN, (m) Group Engr., Electronics Dept., The Glenn L. Martin Co., Baltimore 3, Md. Home: 6105 Elinore Ave., Baltimore 6, Md.

JENSEN, RICHARD C., (a) Design Engr., Axial Compressor Dept., Carrier Corp., Thompson Rd., Syracuse, N. Y. Home: 118 Mark Ave., East Syracuse, N. Y.

JERMAIN, ROBERT A., (m) Product Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 11 Mayfair Rd., Morris Plains, N. J.

JETTA, NORMAN W., (s) Purdue University, West Lafayette, Ind. Home: 416 North Chauncey, W. Lafayette, Ind.

JEWELL, WILLIAM S., (s) Massachusetts Institute of Technology, 420A Graduate House, Cambridge 39, Mass.

JEWETT, C. LINCOLN, (m) Mgr., Washington, D. C. Office, Arthur D. Little, Inc. 1625 Eye St. N.W., Washington 6, D. C. Home 1511 26th St. N.W., Washington 7, D. C.

JEWETT, ROBERT H., (m) Chief Engr., Pilotless Aircraft Division, Boeing Airplane Company, P. O. Box 3107, Seattle 14, Wash. Home: 12461 N.E. Bellevue-Redmond Rd., Bellevue, Wash.

JEWETT, WARREN R., (a) Staff Scientist, Quantum, Inc., 756 No. Brooksvale Road, Cheshire, Conn. Home: Race Brook Rd., Woodbridge, Conn.

JIRSA, LARMON L., (m) Chief Propulsion Group Engr., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 5203 La Jolla Blvd., La Jolla, Calif.

JOB, FREDERICK R., JR., (m) Proj. Engr., Jet Flame Applications, Development Laboratory, Linde Air Products Co., 686 Frelinghuysen Ave., Newark, N. J. Home: 47 Floyd St., Belleville 9, N. J.

JOHN, JAMES E. A., (s) Research Assistant, Princeton Univ., Forrestal Research Center, Princeton, N. J. Home: 196 Graduate College, Princeton, N. J.

JOHN, RICHARD R., (s) Home: 70 Berrian Rd., New Rochelle, N. Y.

JOHNSEN, KENNETH, (a) Mech. Designer, Johnsen Design Service, 5 Northfield Ave., W. Orange, N. J. Home: Whippany Rd., Whippany, N. J.

JOHNSEN, KENNETH, (m) Design Engr., North American Aviation, Inc., 4300 E. Fifth Ave., Columbus, O. Home: 797 S. Weyant Ave., Columbus, O.

JOHNSON, BOYD M., (m) Vice President, Refractories Division, The Carborundum Company, Post Office Box 268, Perth Amboy, N. J. Home: 164 Maple Ave., Metuchen, N. J.

JOHNSON, CHARLES M., (m) Chief, Systems Evaluation Branch, Electronic Warfare Division, White Sands Signal Corps Agency, White Sands Proving Ground, N. M. Home: 1720 Foster Rd., Las Cruces, N. M.

JOHNSON, CORYDON M., (m) President, Corydon M. Johnson Co., Inc., Bethpage, L. I., N. Y. Home: 28 Magum Rd., Babylon, L. I., N. Y.

JOHNSON, DONALD E., (m) Project Engineer, Architect-Engineer Division, Aerojet-General Corp., 410 N. Citrus, Covina, Calif. Home: 5800 Bonnie Cove, Covina, Calif.

JOHNSON, ELLMAR D., (a) Corp., U. S. Army, RA17388911, Hq. 46th FA Grp., Ft. Bliss, Tex. Home: Buhler, Kansas

JOHNSON, ERIC K., (s) University of Illinois, Urbana, Illinois. Home: 1970 W. Winona, Chicago 40, Ill.

JOHNSON, FREDERICK M., (m) Executive Assistant to President, W. F. and John Barnes Company, 301 S. Water St., Rockford, Ill. Home: 424 Rome Ave., Rockford, Ill.

JOHNSON, GUST E., (m) Electronic Scientist, Office of Area Frequency Coord., White Sands Signal Corps Agency, N. M. Home: 1425 Thomas Dr., Las Cruces, N. M.

JOHNSON, H. JAMES, (m) Res. Engr., Engng., Penberthy Injector Co., 1242 Holden Ave., Detroit 2, Mich. Home: 519 Washington Rd., Grosse Pointe 30, Mich.

JOHNSON, HAROLD W., (m) Gen. Fore. Mfg., Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 1531 N. Wilton Pl., Hollywood 28, Calif.

JOHNSON, JAMES H., (m) GMRD Division, Ramo-Wooldridge Corp., 8820 Bellanca Ave., Los Angeles 45, Calif. Home: 4830 Coliseum St., Los Angeles, Calif.

JOHNSON, JOHN M., (m) Aeronautical Rocket Power Plant Test Eng., Liquid Propellant Branch, EML, White Sands Proving Ground, Home: 5631 Challen St., Arlington, Calif.

JOHNSON, MORRIS E., (m) Contracting Engr., Consolidated Western Steel Div., U. S. Steel Corp., P. O. Box 2015, Terminal Annex, Los Angeles 54, Calif. Home: 1828 So. 10th Ave., Monrovia, Calif.

JOHNSON, N. DALE, Senior Research Engr., Design & Development, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 45121 W. 11th, Lancaster, Calif.

JOHNSON, S. KENNETH, (m) Partner, Daniel, Mann, Johnson & Mendenhall, 4201 Sunset Blvd., Los Angeles, Calif. Home: 3854 Shannon Rd., Los Angeles 27, Calif.

JOHNSON, WAYNE R., (m) Engng. Supervisor, EAFB, Engng. Test Section, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 8049 McNulty Ave., Canoga Park, Calif.

JOHNSON, WILLIAM G., (a) Res. Chem. Engr., Explosives Dept., E. I. duPont de Nemours & Co., Inc., Burnside Laboratory, Penns Grove, N. J. Home: 3 Ash Ave., Woodstown, N. J.

JOHNSTON, GALEN S., (s) Parks College, E. St. Louis, Ill. Home: Pawnee City, Neb.

JOHNSTON, HERRICK L., (a) President, Herrick L. Johnston, Inc., 540 W. Poplar Ave., Columbus 8, O. Home: 177 Brevoort Rd., Columbus, O.

JOHNSTON, S. PAUL, (a) Director, Institute of the Aeronautical Sciences, Inc., 2 E. 64th St., New York 21, N. Y. Home: 140 Littlebrook Rd., Princeton, N. J.

JOHNSTON, ROBERT E., (m) Res. Engr., North American Aviation, Inc., Santa Susana Plant, Chatsworth, Calif. Home: 6857 Zelzah, Reseda, Calif.

JOHNSTON, STEWART A., (m) Chairman, Div. of Natural Sciences, Los Angeles State College, 855 N. Vermont, Los Angeles 29, Calif. Home: 654 E. Calaveras St., Altadena, Calif.

JOHNSTON, THOMAS E., (a) PR Account Exec., Grant Advertising, 655 Madison Ave., N. Y. 21, N. Y. Home: 400 E. 52nd St., N. Y. 22, N. Y.

JONAS, JULIUS, (m) Staff Engr., Lockheed Aircraft Co., Missile Div., Woodley & Saticoy Sts., Van Nuys, Calif. Home: 7929 W. 4th St., Los Angeles 48, Calif.

JONES, BRUCE C., (m) Chief Engr., Allied Research & Engng. Div., Allied Record Mfg. Co., 6916 Santa Monica Blvd., Hollywood 38, Calif. Home: 321 E. Camino Real, Monrovia, Calif.

JONES, IRA P., JR., (m) Staff Engr., ARO, Inc., Box 162, Tullahoma, Tenn. Home: 910 Cantrell Ave., Nashville 5, Tenn.

JONES, JUNE G., (m) Res. Physicist, Geo-Science, Inc., P. O. Box 1128, Alamogordo, N. M. Home: 2302 Williow Dr., Alamogordo, N. Mex.

JONES, PAUL R., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 7?35 Sylvia Ave., Reseda, Calif.

JONES, ROBERT F., (m) Engr., Temco Aircraft Corp., Dallas, Tex. Home: 8507 Swananoah Rd., Dallas 9, Tex.

JONES, ROBERT R., (a) Draftsman, Taccone Pneumatic Fdry. Equip. Corp., W. Main St., North East, Pa. Home: 1053 Smithson Ave., Erie, Pa.

JONES, ROBERT W., (m) Technical Staff, Propulsion Department, Guided Missile Division, Hughes Aircraft Company, Florence & Teale Sts., Culver City, Calif. Home: 10249 S. Horley Ave., Downey, Calif.

JONES, WALTER H., (m) Sr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 14205 Moorpark St., Sherman Oaks, Calif.

JOPSON, HUBERT S., (m) Supervisor, Rocketdyne Div., North American Aviation, Inc., Canoga Park, Calif. Home: 6622 Lubao Ave., Woodland Hills, Calif.

JORDAN, ARNOLD R., (m) Colonel USMC Retd., Staff Armament Group, Chance Vought Incorporated, P. O. Box 5907, Dallas, Tex. Home: 1716 Woods Dr., Arlington, Tex.

JORDAN, JOHN A., (m) Assoc. Res. Engr., Physical Research Staff, Boeing Airplane Co., E. Marginal Way, Seattle, Wash. Home: 14753 S.E. 39th, Bellevue, Wash.

JORGENSEN, WALTER T., (a) Flight Engr., Operations Section, Seaboard and Western Airlines, 80 Broad St., New York City, N. Y. Home: 23 Matheron Ave., Baldwin, N. Y.

JOSE, PAUL D., (m) Chief, Optical Laboratory, Flight Determination Lab., W.S.P.G., Holloman AFB, New Mex. Home: 810 Cedar Ave., Alamogordo, N. M.

JOSLIN, RICHARD M., (m) Sales Mgr., Industrial Chemicals Division, Carbide & Carbon Chemicals Co., 30 East 42nd St., New York 17, N. Y. Home: 7 Valley View, Chappaqua, N. Y.

JOVANOVIC, MILAN K., (s) Northwestern University, Evanston, Ill. Home: 819 Washington St., Evanston, Ill.

JOYCE, TEMPLE N., (a) President, Bradco Inc., 1503 Court Square Bldg., Baltimore 2, Md. Home: Joyce Lane, Arnold P. O., Md.

JULIN, KENNETH F., (m) Executive Vice President and General Manager, Leach Corporation, 5915 Avalon Blvd., Los Angeles 3, Calif. Home: 614 N. Old Ranch Rd., Arcadia, Calif.

JULIUS, ANTHONY L., JR., (m) St. Louis University, St. Louis, Mo. Home: 507 Sixth St., Campbell, O.

K

KADEN, GEORGE, (a) Mech. Project Engr. "A", Defense Electronics Products, Radio Corp. of America, Moorestown, N. J. Home: 18 C Parkway Apt., Haddonfield, N. J.

KADOTA, HAYAO, (m) Des. Engr., Aerojet-General Corp., Irwindale Ave., Azusa, Calif. Home: 2406 Havenbrook St., W. Covina, Calif.

KAHANE, ABRAHAM, (m) Aerodynamics Sect. Chief, Research and Advanced Development Div., Avco Manufacturing Corp., Stratford, Conn. Home: 65 Melbourne St., Bridgeport, Conn.

KAHN, MARVIN J., (m) Chief Structures & Aerodynamics Engr., Structures & Aerodynamics Dept., Aircraft Armaments Inc., Cockeysville, Md. Home: 3118 Bancroft Rd., Baltimore 15, Md.

KALIKOFF, STANLEY, (m) Assist. Research Eng., Stratos Div., Fairchild Eng. & Airplane Corp., Bayshore, L. I., N. Y. Home: 50 No. Clinton Ave., Bayshore, L. I., N. Y.

KALLIS, FELIX, (m) Sr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 20643 Quedo Dr., Woodland Hills, Calif.

KALLIS, STEPHEN A., (s) Columbia Univ., 713 Hartley Hall, Columbia Univ., New York 27, N. Y. Home: 282 Main St., Winchester, Mass.

KALP, LESTER H. (m) Lab. Tech., Bell Aircraft Corp., P.O. Box 1, Buffalo 5, N. Y. Home: 79 Palmer Ave., Kenmore 17, N. Y.

KAMENECKA, HENRY, (s) New York University, University Heights, Bronx, N. Y. Home: 1790 Clinton Ave., Bronx, N. Y.

KAMMEYER, ROGER A., (a) Associate Engineer, Experimental Aerodynamics, The Glenn L. Martin Co., Middle River, Baltimore 3, Md. Home: 342 Magnolia Terr., Baltimore 21, Md.

KANNER, GIDEON, (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 5336 Amigo Ave., Tarzana, Calif.

KANTROWITZ, ARTHUR, (m) Director, Avco Research Lab., Research and Advanced Development Div., Avco Manufacturing Corp., Stratford, Conn. Home: 25 Spring Valley Rd., Arlington, Mass.

KAPLAN, JOSEPH, Professor of Physics, University of California, 405 Hilgard Ave., Los Angeles 24, Calif. Home 1732 Kelton Ave., Los Angeles 24, Calif.

KAPLAN, MAXWELL H., (m) Technical Staff (Metallurgy), Propulsion Department, Hughes Aircraft Co., Culver City, Calif. Home: 3667 Jasmine St., Los Angeles 34, Calif.

KARPUS, PETER G., (m) Mgr.—New Product Planning, Development Dept.—AGTD, General Electric Co., Evendale, O. Home: 9910 Zig Zag, Cincinnati 36, O.

KARAGEORGE, GEORGE J., (m) Test Engr., Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 200 Burnet St., Ft. Worth, Tex.

KAREFF, JOSEPH D., (a) Bookkeeper, Hy-grade Paper Co., 741 Bailey Ave., Buffalo 4, N. Y. Home: 524 Broadway, Buffalo 4, N. Y.

KAREN, BERNARD, (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8150 McNulty Ave., Canoga Park, Calif.

KARGES, CHARLES E., (s) Purdue University, 328 Salisbury, West Lafayette, Ind. Home: 618 S. Willow Rd. Evanston, Ill.

KARNOW, PAUL, (m) Aeronautical Engr., Naval Air Development Center, Johnsville, Pa. Home: 3336 Decatur St., Philadelphia 36, Pa.

KARPENKO, VADIM A., (m) Engng. Res., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 1744½ N. Garfield Pl., Los Angeles 28, Calif.

KARR, ERROL H., (m) Mgr., Tech. Dev., Pennsylvania Salt Mfg. of Washington, 2901 Taylor Way, Tacoma 1, Wash. Home: 6624 No. "M" St., Tacoma 3, Wash.

KARSCH, HERBERT L., (m) Installation Engr., Installation Engng. Office, White Sands Proving Ground, Las Cruces, N. M. Home: 215 Oxford Dr., Las Cruces, N. M.

KARTVELI, ALEANDER, (m) Vice President-Chief Engr., Republic Aviation Corporation, Farmingdale, L. I., N. Y. Home: Richard Lane, Huntington, N. Y.

KASNITZ, HAROLD L., (m) Sr. Engr., American Machine & Foundry Co., 1085 Commonwealth Ave., Boston, Mass. Home: 93 Perry St., Brookline 46, Mass.

KASPER, VICTOR J., (a) Rocket Eng. Test Lab., AFFTC. Edwards AFB, Edwards, Calif. Home: P. O. Box 431, Edwards, Calif.

KASPER, WALTER, (m) Dynamics Engr., Bell Aircraft Corp., Buffalo 2, N. Y. Home: 278 Morgan St., Tonawanda, N. Y.

KASS, CHARLES L., (s) Westchester Community College. Home: 655 Burke Ave., Bronx 67, N. Y.

KASS, GEORGE, (m) Sr. Proj. Engr., East Coast Aeronautics, Division of Barium Steel Corp., 10 Pelham Parkway, Pelham Manor, N. Y. Home: 3056 Beltagh Ave., Wantagh, N. Y.

KATANIK, MICHAEL, (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne 2, Ind. Home: 5005 Finn Ave., Cleveland 27, O.

KATZ, ARTHUR, (s) Academy of Aeronautics, LaGuardia Field, Flushing, L. I., N. Y. Home: 147-53 72nd Dr., Flushing 67, N. Y.

KATZ, ELLIOTT L., (m) Sr. Thermodynamics Engr., Thermodynamics, Group, Convair, A Division of General Dynamics Corp., Pacific Highway, San Diego 13, Calif. Home: 1141 Moana Dr., San Diego 7, Calif.

KATZ, RICHARD, (m) Des. Engr., Aerojet-General Corp., Box 1947, Sacramento, Calif. Home: 5141 V. St., Sacramento, Calif.

KATZ, ROBERT, (s) Calif. Institute of Technology, Pasadena, Calif. Home: 945 S. Euclid Ave., Pasadena, Calif.

KAUFFMANN, HANS O., (m) Technical Director, Becco Chemical Division, Food Machinery & Chemical Corporation, Station B., Buffalo 7, N. Y. Home: 58 Koster Row, Eggertsville 21, N. Y.

KAYE, KENNETH S., (a) Res. Engr., Preliminary Design, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 2239 Benedict Canyon Dr., Beverly Hills, Calif.

KEANE, JOHN D., (m) Acting Supervisor, Chemical Engng. Res., Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill. Home: 525 S. Home Ave., Oak Park, Ill.

KEEFE, JOHN H., (m) Proj. Supv., Becco Chemical Division, Food Machinery & Chem. Corp., Buffalo, N. Y. Home: 180 Royal Parkway, W., Williamsville, N. Y.

KEEGAN, NORMAN R., Research Chemist, Reeve Paint Mfg. Co., Inc., 426 Erie Blvd., E. Syracuse 2, N. Y. Home: 204 Danbury Dr., Syracuse 2, N. Y.

KEELER, RAYMOND A., (a) Supervisor Area #2, Large Eng., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 7024 Wortser Ave., No. Hollywood, Calif.

KEENA, FRANK J., (s) Utica College of Syracuse Univ., 520 Plant St., Utica, N. Y. Home: 506 N. Madison St., Rome, N. Y.

KEITH, ARLANDO B., (s) The University of Texas, Austin, Tex. Home: 1518 Barton Springs Rd., Austin 4, Tex.

KELLAR, DAVID G., (m) Mgr. Ind. & Public Relations, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 111 Kenilworth Ave., Mt. Lakes, N. J.

KELLER, JAMES L., Sr. Section Leader, Res. Department, Union Oil Company of California, Brea, Calif.

KELLEY, EDWARD H., Group Engr., Columbus Div., North American Aviation, Inc., 4300 E. 5th Ave., Columbus, O. Home 2873 E. Moreland Dr., Columbus, O.

KELLEY, JOHN F., (m) Proj. Engr., Santa Susana Test Facilities, North American Aviation, Inc., Downey, Calif. Home: 1212 So. Euclid, Pasadena, Calif.

KELLEY, JOSEPH, JR., (m) Vice President, Allied Research Associates, Inc., 43 Leon St., Boston 15, Mass. Home: 5 Oakridge Rd., Wellesley Hills, Mass.

KELLOGG, WILLIAM W., (m) SHAPE Air Defense Technical Center, P. O. Box 174, Den Haag, Holland.

KELLY, ARNOLD J., Research Engr., Preliminary Design, Rocketdyne, A Division of North American Aviation, Inc., Dept. 596-21, 6633 Canoga Ave., Canoga Park, Calif. Home: 9231 Willis Ave., Van Nuys, Calif.

KELLY, JOSEPH F., JR., (s) Parks College of Aeronautical Technology, East St. Louis, Ill.

KELSEY, GEORGE M., (m) Sr. Proj. Engr., Turbo Engng. Dept., American Machine & Foundry, 12270 Montague St., Pasadena 8, Calif. Home: 1290 Hastings Ranch Dr., Pasadena 8, Calif.

KEMMER, PAUL H., (m) Executive Advisor to Vice President-Engng. & Military Relations, Ryan Aeronautical Company, Lindbergh Field, San Diego, Calif. Home: 25001 Selva Rd., Dana Pt., Calif.

KEMP, BARRON, (a) Assistant Engr., Field Engng. Dept., Western Electric Co., Chatham Rd., Winston-Salem, N. C. Home: 815 Fisher St., Concord, N. C.

KEMP, LEBBEUS C., JR., (m) General Mgr., Petrochemical Department, The Texas Co., 135 E. 42nd St., N. Y. 17, N. Y. Home: #5 Baraud Rd., Scarsdale, N. Y.

KEMPER, DONALD M., (a) Electron. Design, Guided Missile Div., Firestone Tire and Rubber Co., 2525 Firestone Blvd., Los Angeles, Calif. Home: 8579 Holly Way, Buena Park, Calif.

KENDRICK, JAMES B., (m) Proj. Engr., Aerophysics Development Corp., Santa Monica, Calif. Home: 2871 Forrester Dr., Los Angeles 64, Calif.

KENNEALLY, EDMUND D., (m) Test Engr., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 259 Utica St., Tonawanda, N. Y.

KENNEDY, EDWARD R., (m) Proj. Thermodynamicist, North American Aviation, Inc., Columbus 16, O. Home: 340 W. Lake Ave., Columbus 31, O.

KENNETT, HOWARD W., (m) Product Information Specialist, Special Defense Projects, General Electric Co., 32nd & Walnut Sts., Philadelphia, Penn. Home: 17 Alvey St., Schenectady, N. Y.

KENT, MARC THEODORE, JR., (a) Consultant, Morgan Enterprises, 89-10 Whitney Ave., Elmhurst 73, Long Island, N. Y.

KENT, WILLIAM D., (m) President, Flight Engineers' International Ass'n., AFL-CIO, 290 Old Country Rd., Mineola, L. I., N. Y. Home: 91 Parkview Dr., Albertson P. O., N. Y.

KERR, JOHN A., (m) Sr. Design Group Engr., Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 3712 Brighton Rd., Ft. Worth 9, Tex.

KERRY, FRANK G., (a) Manager, Spaco, Inc., 405 Lexington Ave., New York 17, N. Y. Home: 227 Glendale Rd., Scarsdale, N. Y.

KERSHAW, GEORGE C., (m) Vice Pres., Texas Metal and Manufacturing Co., Inc., 6114 Forest Park Rd., Dallas, Tex.

KESSLER, ALAN H., Home: 16 Williams St., Norwich, Conn.

KESSLER, EDWARD R., (s) Associate Engr., Experimental Engng. Dept., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 13-56B Sperber Rd., Fairlawn, N. J.

KETTLING, GEORGE E., (a) University of Cincinnati, Cincinnati 21, O. Mailing: 537 Howell Ave., Cincinnati 20, O.

KEYS, DON D., (m) Chief, Design Branch, Systems Laboratory Division, White Sands Signal Corps Agency, White Sands Proving Ground, N. M. Home: P. O. Box 1396, Las Cruces, N. M.

KIDD, STEPHEN, (m) Engng. Manager, Jet Propulsion Res., Forrestal Research Center, Princeton University, Princeton, N. J. Home: Lower Harrison St., Princeton, N. J.

KIDWELL, ROBERT P., (m) Physicist, Flight Simulation Branch, EML Division, White Sands P. G., N. M. Home: c/o Billeting Office, Box 115, White Sands P. G., N. M.

KIEBERT, MARTIN V., JR., (m) Director of Research-Electronics, Applied Research, Inc., 135 South LaSalle St., Chicago 3, Ill. Home: 1440 E. Dorothy Le., Dayton 9, O.

KILCHER, STANLEY M., (m) Aerodynamicist, McDonnell Aircraft Corp., St. Louis, Mo. Home: 123 Rickel St., West Union, Iowa.

KIMBALL, CURTIS Y., (m) Lt. Colonel, U. S. Army, Hq. 23 Inf., Ft. Lewis, Wash. Home: 15849 E. San Jose St., Puente, Calif.

KIMBALL, DAN A., (m) President, Aerojet-General Corp., Azusa, Calif. Home: 2221 W. Live Oak Dr., Los Angeles 28, Calif.

KIMBALL, JOHN G., (m) President, Turbo Research Corporation, 1630 Euclid St., Santa Monica, Calif. Home: 12006 Sylvester St., Los Angeles 66, Calif.

KIMBALL, ROBERT B., (a) Assoc. Chemist, Phillips Petroleum Co., Nat. Reactor Testing Station, Idaho Falls, Idaho. Home: 1048 Lovejoy St., Idaho Falls, Idaho.

KIMM, WILLARD C., (m) Director of Public Relations, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: Stag Lake, Andover, N. J.

KIMURA, MINORU, (a) Senior Partner, Kimura Bros., 908 8th Ave., Seattle, Wash.

KINDSVATER, HOWARD M., (m) Staff Scientist, Missiles System Div., Lockheed Aircraft Corp., 7701 Woodley, Van Nuys, Calif. Home: 15004 Dickens, Sherman Oaks, Calif.

KING, ARCHER E. III, (m) Engr. Flt. Anal. Group, Pilotless Aircraft Div., Boeing Airplane Co., 7755 E. Marginal Way, Seattle 14, Wash. Home: 909 Fourth Ave., Seattle, Wash.

KING, CHARLES H., JR., (m) Liaison Engr.—Research Dept., United Aircraft Corp., East Hartford, Conn. Home: 251 Spring St., Manchester, Conn.

KING, DOUGLAS A., Sr. Aerodynamics Engr., Hydrodynamics Sect., The Glenn L. Martin Co., Middle River, Baltimore, Md. Home: Palomino St., White Marsh, Md.

KING, LEIGHTON S., (m) Chief, Preliminary Design Engr., Engng. Dept., AiResearch Mfg. Co., 402 S. 36th St., Phoenix, Ariz. Home: 4921 E. Exeter Blvd., Phoenix, Ariz.

KING, WILLIAM RAY, (s) Purdue University, W. Lafayette, Ind. Home: 1022 Rose Circle, Park Hills, Ky.

KINGHORN, GEORGE F., (m) Dept. Engineer, Lockheed Aircraft Corp., P. O. Box 2121, Van Nuys, Calif. Home: 8733 Hazeltine Ave., Van Nuys, Calif.

KINNEY, GEORGE R., (m) Aeronautical Research Scientist, NACA, 21000 Brookpark Rd., Cleveland 11, O. Home: 4318 W. 187th St., Cleveland 11, O.

KINNEY, LAYTON C., (m) Assistant Mgr., Chemistry and Chemical Engng., Dept., Armour Research Foundation, 10 West 35th St., Chicago 16, Ill. Home: 2114 Estes Ave., Chicago 45, Ill.

KINSEY, ROBERT S., (m) Vice-President of Operations, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 187 Hudson Ave., Tenafly, N. J.

KIPIN, GEORGE, (m) Sr. Engr.—Structures, The Glenn L. Martin Co., Baltimore, Md. Home: 215 N. Newark Ave., Ventnor City, N. J.

KIRBY, J. ROBERT, (m) Chief, Tech. Dept., Thieblot Aircraft Co., 4924 Hampden Lane, Bethesda, Md. Home: 4904 Newport Ave., Washington 16, D. C.

KIRCHER, HARTMANN J., (a) Sr. Proj. Engr., Engng., Reaction Motors, Inc., Denville, N. J. Home: 1124 Springbrook Trail, Sparta, N. J.

KIRKLAND, JOHN T., (m) Supervisor—Missiles Section, Propulsion & Structural Research Dept., Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill. Home: 4520 N. Clarendon Ave., Chicago 40, Ill.

KIRKPATRICK, JAMES S., (m) Vice President-Research & Development, Brooks & Perkins, Inc., 1950 W. Fort Street, Detroit 16, Mich. Home: 5936 Oakman Blvd., Detroit 4, Mich.

KIRKWOOD, KEITH S., (m) Unit 77, Field Service Representative, Pilotless Aircraft Division, Boeing Airplane Company, Seattle, Wash. Home: 317 Hilbert St., Kalamazoo, Mich.

KISTLER, DALE E., (m) Proj. Coordinator, Rocket Eng. Test Facility, Rocket Eng. Test Lab., Edwards AFB, Edwards, Calif. Home: 1258 W. H. 15th St., Lancaster, Calif.

KISTLER, WALTER P., President, Kistler Instrument Co., 15 Webster St., Tonawanda, N. Y. Home: 639 Loretta St., Tonawanda, N. Y.

KLAGER, CARL, (m) Dept. Head., Propellant Development, Aerojet-General Corp., Azusa, Calif. Home: 168 No. Canyon Blvd., Monrovia, Calif.

KLAMT, ROBERT H., (s) University of California, Berkeley, Calif. Home: 678 B. St., Yuba City, Calif.

KLECZEK, WALTER S., (m) Supervisor—X-405 Development Unit, AGT Development Dept., General Electric Co., Malta Test Station, Ballston Spa, N. Y. Home: 2232 Van Rensselaer Dr., Schenectady, N. Y.

KLEIN, JOHANN J., (m) Chief, Technical Engr., Guided Missiles Division, Republic Aviation Corporation, 447 Broadway, Hicksville, N. Y. Home: 72-59 Little Neck Parkway, Glen Oaks, N. Y.

KLEINER, EDWARD, (s) Home: 116 Haseco Ave., Port Chester, N. Y.

KLEMACH, FRED A., (m) President, National Design and Research Corp., 2175 W. Stadium, Ann Arbor, Mich. Home: 1480 Roxbury Rd., Ann Arbor, Mich.

KLEMPERER, WOLFGANG B., (m) Missiles Research, Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 738 So. Bristol Ave., Los Angeles 49, Calif.

KLENHA, ROBERT J., (m) Test Engr., Aerojet-General Corp., Azusa, Calif. Home: 231 So. Hudson, Pasadena 5, Calif.

KLEPEIS, JAMES E., (s) Rennselaer Polytechnic Inst., Troy, N. Y. Home: 1038 Southern Blvd., Bronx 59, N. Y.

KLICK, M., (m) Chief Engr., Consolidated Western Steel Div., U. S. Steel Corp., 5700 E. Eastern Ave., P. O. Box 2015, Terminal Annex, Los Angeles 54, Calif.

KLIER, ALEXANDER G., (m) Base Dental Surgeon, 86th Fighter Interceptor Wing, APO 65, N. Y. Home: 426 W. Western Ave., Muskegon, Mich.

KLIEVER, WALDO H., (m) Vice President, Instrument Development Dept., Clevite-Brush Development Co., 540 E. 105th St., Cleveland 8, O. Home: 2472 Overlook Rd., Cleveland Hts. 6, O.

KLINE, MELVIN B., Manager, Missile Engng., Technical Products Division, Allen B. Dumont Labs., Inc., 11800 Olympic Blvd., Los Angeles 64, Calif.

KLINE, STEPHEN J., (m) Assist. Professor, Rm. 261A Stanford University, Stanford, Calif.

KLUEG, JEROME, (a) Designer, Port of N. Y. Authority, 111—8th Ave., New York 8, N. Y. Home: 219—04 14th Ave., Queens Village, N. Y.

KNAPPMAN, ROBERT D., (m) Equipment Design Engr., Experimental Rocket Test Lab., Edwards Air Force Base, Edwards, Calif. Home: 44025 No. Date Ave., Lancaster, Calif.

KNARR, HENRY S., (a) Res. Engr., Research Dept., Copes-Vulcan, Div. Blaw-Knox Co., 26th & Cascade St., Erie, Penna. Home: 440 W. 28th St., Erie, Penna.

KNERR, DIETRICH H., (s) Purdue University, W. Lafayette, Ind. Home: 1931 Esperanza, Houston, Tex.

KNIGHT, CHARLES A., (m) Proj. Engr.-Structures, Guided Missile Division, Firestone Tire & Rubber Company, 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 3931 Westside Ave., Los Angeles 8, Calif.

KNIGHT, RICHARD E., (m) Head, Aerodynamics Section, Design Analysis Dept., Goodyear Aircraft Corp., 1210 Massillon Rd., Akron 15, O. Home: 3367 Adaline Dr., Stow, O.

KNISSEL, EUGENE A., (s) Academy of Aeronautics, LaGuardia Airport, Flushing, N. Y. Home: 2888 Grand Concourse, Bronx 58, N. Y.

KNITTLE, WALTER A., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 23222 Canzonet St., Woodland Hills, Calif.

KNOBLE, ROBERT L., (m) Lead Technician—Hydraulic Servomechanisms Dept., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 20 Dorris Ave., Buffalo 15, N. Y.

KNOLL, E. F., (m) Assist. Sr. Engr., Group Leader, Materials Dept., Liquid Engine Div., Aerojet-General Corp., Azusa, Calif. Home: 556 Valmont Dr., Monrovia, Calif.

KNOTHE, ADOLF H., (m) Chief, Guidance Theory Section, Guided Missile Development Division, Redstone Arsenal, Huntsville, Ala. Home: 1009 Sandlin St., Huntsville, Ala.

KNOTT, JAMES E., (m) Assistant Manager, Aircraft Sales & Contracts, Allison Division, General Motors Corporation, P. O. Box 894, Indianapolis 6, Ind. Home: 706 Nottingham Court, Indianapolis, Ind.

KNOX, JONATHAN H., (m) Colonel USAF, Development Directorate, Kirtland Air Force Base, Albuquerque, N. M. Home: 607 Parkland Circle S.E., Albuquerque, N. M.

KNOX, THOMAS B., (m) Assist. Dept. Head, Silver Spring Lab., Vitro Corp., 962 Wayne Ave., Silver Spring, Md. Home: 2303 Metzrott Rd., Adephi, Md.

KNUTH, ELDON L., (m) Aerodynamics Engr., Aerodynamics Dept., Aerophysics Dev. Corp., Box 949, Santa Monica, Calif. Home: 1443 S. Fernwood Pacific Dr., Toganga, Calif.

KOBER, CARL L., (a) Manager, Systems Dept., Mechanical Div., General Mills, Inc., 2003 E. Hennepin Ave., Minneapolis, Minn. Home: 4716 Valley View Road, Minneapolis, Minn.

KOCH, BRUCE R., (s) Home: 2169 Cleveland Ave., Westlawn, Pa.

KOCH, HARRY A., (m) Applications Engr., Reaction Motors, Inc., 1373 Westwood Blvd., Los Angeles 24, Calif. Home: 3679 Berryman Ave., Los Angeles 66, Calif.

KOCHEN, BOB L., (s) Home: R.R. 1, Box 169, Florence, Colo.

KOCHIS, THOMAS R., (m) Preliminary Design Engr., Military Relations, Ryan Aeronautical Co., San Diego, Calif. Home: 1001 Peerless Dr., El Cajon, Calif.

KOCKA, DONALD F., (s) Academy of Aeronautics, LaGuardia Airport, N. Y. 71, N. Y. Home: 69-81—182nd St., Flushing 65, N. Y.

KOEGEL, ROBERT J., (s) Parks College of Aero Technology, E. St. Louis, Ill. Home: 36 Prospect St., Baldwin, N. Y.

KOEHLER, WILLIAM R., (s) Machine Design, Spring Garden Inst., Philadelphia, Pa. Home: 8025 Hammond Rd., Cheltenham, Pa.

KOELLE, DIETRICH, E., (s) Technische Hochschule Stuttgart, Stuttgart, Keplerstr. 10, West Germany Home: 19 Neuensteineestrasse, Stuttgart, Zuffenhausen, W. Germany

KOELLE, HEINZ HERMANN, (m) Ac. Chief, Preliminary Design Section, Structure & Mech. Lab., GMDD, Army Ballistic Missile Agency, Redstone Arsenal, Huntsville, Ala. Home: 212 Lincoln St., Huntsville, Ala.

KOELLING, JERRY J., Parks College of Aeronautical Technology, East St. Louis, Ill. Home: 6121 Newport, St. Louis 16, Mo.
KOEN, FRANK L., JR., (m) Physicist, Guided Missile Research Division, The Ramo-Wooldridge Corp., 8820 Bellanca Ave., Los Angeles 45, Calif. Home: 421 Marine Ave., Manhattan Beach, Calif.
KOETHER, FRED A., (m) Head, Technical Information Services, Guided Missiles Research Division, Ramo Wooldridge Corp., Los Angeles, Calif. Home: 404 20th St., Manhattan Beach, Calif.
KOESTER, HAROLD E., (m) Design Engr., Rocket Propulsion Units, Aerojet-General Corp., P.O. Box 1947, Sacramento, Calif. Home: 7418 Heidi Court, Fair Oaks, Calif.
KOETSCH, JULIUS F., (s) Major USMC, Marine Air Control Squadron 1, MAG-11, FMAW, c/o FPO, San Francisco, Calif. Home: 257 Covert St., Brooklyn 7, N. Y.
KOFFEL, JOHN K., (m) Product Engng. Manager, Accessories Division, Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, O. Home: 1117 Allston Rd., Cleveland Hts., O.
KOLCSEY, STEPHEN J., (s) Parks College, E. St. Louis, Mo. Home: 3105 Lincoln Blvd., Cleveland Hts., 18, O.
KOORBANOFF, PAUL A., (m) Process Eng., Daystrom Instrument Corp., Archbald, Pa. Home: Twin Maples, Henryville, Pa.
KOPITUK, RAYMOND C., (m) Chief Materials Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: Ridgedale Ave., E. Hanover, N. J.
KOSHAR, MARTIN M., (m) Assoc. Engr., The Glenn L. Martin Co., P.O. Box 179, Denver 1, Colo.
KOSHIOL, GEORGE P., (m) Power Plant Engr., Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 4928 Cedar Hill Rd., Ft. Worth 7, Tex.
KOSTAL, GEORGE J., (m) Ordnance Engr., Picatinny Arsenal, Dover, N. J. Home: Box 661, Landing, N. J.
KOTOWSKI, JOHN A., (m) Sr. Engr., Rocket Div., Glenn L. Martin Co., Baltimore, Md. Home: 1518 Dorton Ave., Baltimore 20, Md.
KOUTNIK, ROD, (m) Engr., Futurecraft Corp., 1717 North Chico Ave., El Monte, Calif. Home: 756 Ocean View Dr., Vista, Calif.
KOVAR, ROBERT P., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 80 Belmont St., Englewood, N. J.
KOVITZ, ARTHUR A., (m) Res. Assistant, Jet Propulsion Research Program, James Forrestal Research Center, Princeton University, Princeton, N. J. Home: 60 Battle Rd., Princeton, N. J.
KOZICH, STEVE S., (m) Mech. Engr., Vard Inc., 2981 E. Colo., Pasadena, Calif. Home: 10524 S. Dalmatian, Whittier, Calif.
KRAEMER, ROBERT S., (m) Supervisor, Preliminary Design, Engng. Dept., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 22735 Burbank Blvd., Woodland Hills, Calif.
KRAICK, GEORGE A., (s) International Business College, 120 W. Jefferson, Ft. Wayne, Ind. Home: 2507 Oliver St., Ft. Wayne 5, Ind.
KRAMER, SIMEON B., (s) New York University, University Heights, New York 53, N. Y. Home: 1700 Harrison Ave., New York 53, N. Y.
KRANCZ, JOSEPH A., (m) Checker, L.R.P., Aerojet-General Corp., Nimbus, Calif. Home: 2105 Rockbridge, Sacramento, Calif.
KRAUSE, WARREN H., (a) Process Engr., Standard Oil Co., Midland Bldg., Cleveland 13, O. Home: 5020 Stickney Ave., Cleveland 9, O.
KRATZER, JOHN L., (m) Chief, Warhead Section, Guided Missiles & Rockets Branch, Army Chemical Center, Baltimore, Md. Home: Box 287, Rt. 15, Baltimore 20, Md.
KRC, JOHN JR., **(m)** Assist. Supervisor, Armour Research Foundation, 10 West 35th St., Chicago 16, Ill. Home: 3240 West 62nd Place, Chicago 29, Ill.
KRESSE, ARTHUR O., (m) Project Engr., Staff Res. and Devel., Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland 3, O. Home: 909 Keystone Dr., Cleveland Hts. 21, O.
KRIEGER, STUART A., (m) Vice Pres., Planning Research Corp., 941 Westwood Blvd., Los Angeles 24, Calif. Home: 710 Alma Real. Pacific Palisades, Calif.
KROLL, GUSTAV A., (m) Chief, Fuselage Design Sec., Redstone Arsenal, Huntsville, Ala. Home: 707 McClung St., Huntsville, Ala.
KROPF, VICTOR J., (m) Assist. to Sales Mgr., Defense Products-Hdqtrs., Westinghouse Electric Corporation, 401 Liberty Ave., Pittsburgh 30, Pa. Home: 8962 Eastwood Rd., Pittsburgh 21, Pa.
KROY, RALPH E., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 16204 Ohio, Detroit 21, Mich.
KRUEGER, FREDERICK G., (a) Engr., Manufacturing Res. Dept., Ford Motor Co., Dearborn, Mich. Home: 9111 Frederick Dr., Livonia, Mich.
KRULL, STEPHEN D., (m) Rocket Lab. Sub. Section Leader, Bell Aircraft Corp., Buffalo 5, N. Y. Home: 19 S. Lawn Ct., Tonawanda, N. Y.
KRUMBHOLZ, STANLEY G., (m) Dev. Engr., Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 20234 E. Palm Dr., Glendora, Calif.
KRUMMEL, FREDERICK C., (a) Chief Project Engr., Central Engng., Irvington Varnish & Insulator, Division of Minnesota Mining & Mfg. Co., 6 Argyle Terrace, Irvington 11, N. J. Home: 59 Woodland Ave., East Orange, N. J.
KRUPP, WILLIAM E., (m) Instrumentation Supervisor, Project SMART (Supersonic Military Air Research Track), Coleman Engineering Company, Inc., 6040 W. Jefferson Blvd., Los Angeles 16, Calif. Home: 7926 Winsford Ave., Los Angeles 45, Calif.
KRUSE, PAUL W., (m) Physicist, Solid State Physics Group, Farnsworth Electronics Co., 3702 E. Pontiac, Ft. Wayne, Ind. Home: 145 Maverick Pl., Ft. Wayne, Ind.
KUBICA, ANDREW JOHN, (m) Mech. Engr., Bell Aircraft Corp., Niagara Falls, N. Y. Home: 1132 Parkside Ave., Buffalo, N. Y.
KUCHER, A. A., (m) Director, Scientific Lab., Engng., Staff, Ford Motor Co., P. O. Box 2053, Dearborn, Mich.
KUCHER, JOSEPH E., (m) Industrial Consultant Engr. Home: 521 Jauncey Ave., Lyndhurst, N. J.
KUCHER, VOLODIMIR B., (m) Chief, Rocket Flight Section, Rocket Branch, Ballistic Research Labs., Aberdeen Proving Ground, Md. Home: Otter Point, Abingdon, Md.
KUDROFF, MARVIN J., (a) Associate & Chief Structural Engr., Daniel, Mann, Johnson, & Mendenhall, 4201 Sunset Blvd., Los Angeles 29, Calif. Home: 4545 Atoll Ave., Sherman Oaks, Calif.
KUEHL, DONALD K., (m) Res. Engr., Research Department, United Aircraft Corporation, East Hartford, Conn. Home: 16 North Elm St., Manchester, Conn.
KUHLMAN, GERTRUDE C., (m) Mathematician, Ignition Res., U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa. Home: 5359 Youngridge Dr., Pittsburgh 36, Pa.
KUHN, WAYNE E., (m) Gen. Mgr., Rsearch & Tech. Dept., The Texas Co., 135 E. 42nd St., New York 17, N. Y. Home: P.O. Box 617, Fishkill, N. Y.
KUHRT, WESLEY A., (m) Chief Research Engr., Research Department, United Aircraft Corporation, 400 Main St., East Hartford 8, Conn. Home: Ash Swamp Rd., Glastonbury, Conn.
KUMAGAI, SEICHIRO, (m) Professor, University of Tokyo, Dept. of Aeronautics, Bunkyo-ku, Tokyo, Japan. Home: Takehayacho 82, Bunkyo-ku, Tokyo, Japan.
KUMM, EMERSON L., (m) Sr. Engr., Propulsion Research Corp., 1860 Franklin, Santa Monica, Calif. Home: 1212 Monument, Pacific Palisades, Calif.
KUNTZ, ROBERT F., (m) Factory Mgr., Guided Missile Division, Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 211 Lemon Ave., Walnut, Calif.
KUNZ, KENNETH E., (m) Des. Engr., Power Plant Development Group, North American Aviation, Inc., 5701 W. Imperial Hwy., Los Angeles 45, Calif. Home: 1001 Bayview Dr., Manhattan Beach, Cal.
KUPIEC, HARRY P., (m) General Mgr., Aircraft Equipment Testing Company, 1812 Fleet St., Baltimore 31, Md. Home: 4020 Deepwood Rd., Baltimore 18, Md.
KUPPERIAN, JAMES E., JR., (m) Physicist, Naval Research Lab., Washington 25, D. C. Home: 335 Irvington St., S.E., Washington 21, D. C.
KURT, GEORGE, (m) Supervisor, Aerojet-General Corp., P.O. Box 1168, Sacramento, Calif. Home: 2615 Q St., Sacramento, Calif.
KURTZ, WILLIAM J., (m) Dept. Head, Rocket & Mechanical Testing Dept., Test & Field Service Div., Aerojet-General Corp., Irwindale Ave., Azusa, Calif. Home: 706 E. Norman Ave., Arcadia, Calif.
KUTRUMANES, CONSTANTINE P., (m) Sr. Engr., Radar & Communications Section, Cook Research Laboratory, 8100 N. Monticello Ave., Skokie, Ill. Home: 5324 W. Congress Pkwy., Chicago 44, Ill.
KUTO, GEORGE R., (a) Assist. Eng., Bendix Missile Division, Mishawaka, Ind. Home: 4117 Norton Dr., So. Bend, Ind.
KUX, FRANK W., (m) Engineering Specialist, Marquardt Aircraft Co., Van Nuys, Calif. Home: 17223 Rayen St., Northridge, Calif.
KWACZALA, CHARLES JOSEPH, JR., (s) 221 E. Washington Blvd., Ft. Wayne, Ind. Home: 260 Seneca Place, Lancaster, N. Y.
KYGER, JACK A., (m) Project Dir., Research and Advanced Development Div., Avco Manufacturing Corp., Stratford, Conn. Home: Ridgeview Rd., Orange, Conn.
KYSER, GERALD M., (m) Mathematician, Technical Development Branch, Phillips Petroleum Company, Box 548, McGregor, Tex. Home: 1203 W. llth, McGregor, Tex.

L

LA BONTE, ERNEST G., (s) Pfc., U. S. Army, White Sands Proving Ground, N. M. Home: 38 Liberty Ave., Lexington 73, Mass.
LADD, ALVIN W., (m) California Institute of Technology, Pasadena, Calif. Home: 2718 Fisk Lane, Redondo Beach, Calif.
LADDEN, RICHARD M., (s) New York University. Home: 90-23 149th St., Jamaica 35, N. Y.
LADANYI, DEZSO J., (m) Aeronautical Res. Scientist, Combustion Section, Rocket Branch, Fuels and Thermodynamics Division, Lewis Flight Propulsion Laboratory, NACA, 21000 Brookpark Rd., Cleveland 11, O. Home: 3098 Ashwood Rd., Cleveland 20, O.
LAFEVRE, LELAND M., (m) Electro Mechanical Engr., Engng., Melpar Inc., 3000 Arlington Blvd., Falls Church, Va. Home: 2020 S. Randolph St., Arlington, Va.
LAGORE, JOSEPH A., (m) Vice President-Manufacturing, Government & Industrial Division, Philco Corporation, 4700 Wissahickon Ave., Phila. 44, Pa. Home: 1411 Hunter Rd., Rydal, Pa.

LA GOW, HERMAN E., (m) Physicist, Rocket Sonde Branch, Naval Res. Laboratory, Code 7153, Washington, D. C. Home: 13 Bolling Rd., Alexandria, Va.

LAGUNOW, ALEXANDER, (m) Designer "C", Lehigh Engineering Associates, 295 Plane St., Newark, N. J. Home: 18 Ann St., Harrison, N. J.

LA HAYE, FRANK W., (m) Vice-President, Res. & Engng., McCormick-Selph Assoc., Hollister Airport, Hollister, Calif. Home: 376 Sixth, Hollister, Calif.

LAHDE, REINHARD N., (m) Res. Physicist, H. A. Wagner Co., 14707 Keswick St., Van Nuys, Calif. Home: 5345 Yolanda Ave., Tarzana, Calif.

LAIRD, A. WILSON, (m) Vice President, Aviation Sales, The New York Air Brake Company, 230 Park Ave., New York 17, N. Y. Home: 11 Oliphant Ave., Dobbs Ferry, N. Y.

LAKEY, GEORGE L., (m) Engr.-Supervisor, Pilotless Aircraft Div., Boeing Airplane Co., Seattle 14, Wash. Home: 118 Babcock St., Melbourne, Fla.

LAKIN, WILFORD P., (m) Sr. Sect. Leader, Union Oil Co. of Calif., Research Div., Research Center, Brea, Calif. Home: 155 Miramonte Dr., Fullerton, Calif.

LAMONT, ERNEST A., (m) Des. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 23109 Canzonet Dr., Woodland Hills, Calif.

LANCTOT, JOHN W., (a) Engr., Tucson Realty & Trust Co., P. O. Box 990, Tucson, Ariz. Home: 112 Calle El Centro, Tucson, Ariz.

LANDER, WILLIAM K., (a) Assoc. Engr., Missiles Engng., Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 2528¼ Centinela, W. Los Angeles 64, Calif.

LANDERMAN, ABRAHAM M., (m) Analytical Engr., Research Dept., United Aircraft Corp., 400 Main St., E. Hartford, Conn. Home: 116 Canterbury St., Hartford 5, Conn.

LANDESBERG, ERWIN, (m) Engr., Aerojet-General Corp., Nimbus, Calif. Home: 4100 Warren Ave., Sacramento, Calif.

LANDSBERG, FREDERICK J., (s) Home: 16 Soper Ave., Baldwin, L. I., N. Y.

LANDY, NELSON E., (m) Group Engr., Engng., Glenn L. Martin Co., Middle River, Md. Home: 7903 Rolling View Ave., Baltimore 6, Md.

LANE, THOMAS F., (s) Home: Box 639, R.D. 3, Lancaster, Pa.

LANE, VINCENT A., (a) Colonel, U. S. Army, 1394 Guided Missile Bn., 529 West 42nd St., N. Y., N. Y., Home: 1 Madison Ave., N. Y. 10, N. Y.

LANFORD, WAYNE S., (a) Technical Illustrator, Sr., North American Aviation, Inc., Downey, Calif. Home: 8302 N. 28th Dr., Phoenix, Ariz.

LANG, E. Z., (m) Technical Assistant, Technical Development Branch, Rocket Fuels Div., Phillips Petroleum Co., McGregor, Tex. Home: 4204 Fort, Waco, Tex.

LANG, JAMES R., (m) Engr., Research, Propellant Estimating Unit, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 20740 Roscoe Blvd., Canoga Park, Calif.

LANG, THEODORE E., (s) Draftsman-Designer, Design Dept. JPL, Calif. Inst. of Tech., 4800 Oak Grove, Pasadena, Calif. Home: 765 E. Del Mar, Pasadena, Calif.

LANGE, ERNST, (a) Electrical Engr., Technical Analysis Division, Holloman Air Development Center, Holloman, N. M. Home: 301 Arnold Lane, Alamogordo, N. M.

LANGE, HERMANN E., (m) Research Dept., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 3511 Kite St., San Diego 3, Calif.

LANGE, KARL O., (m) Prof. Mech. Engng., Univ. of Ky., Aero. Research Lab., Lexington, Ky. Home: Rte. 5, Richmond Rd., Lexington, Ky.

LANGE, NORMAN, (s) Academy of Aeronautics, Flushing, N. Y. Home: 199 Sherman Ave., New York 34, N. Y.

LANGFORD, ERIC S., (s) McBurney School, 5 W. 63rd St., N. Y. 23, N. Y. Home: 120 Cabrini Blvd., New York 33, N. Y.

LANGER, JULIAN, (a) Jr. Engr., Design Section, Air Products Inc., 733 Broad St., Emmaus, Pa. Home: 436 N. 3rd St., Emmaus, Pa.

LANSING, RAYMOND P., (m) Vice President, Group Executive and Director, Bendix Aviation Corporation, Teterboro, N. J. Home: 11 Crestmont Rd., Montclair, N. J.

LANTZ, EDWARD, (a) Engr., Knolls Atomic Power Lab., General Electric Co., Schenectady, N. Y. Home: 978 Inman Rd., Schenectady, N. Y.

LAPIERRE, CRAMER W., (m) Vice Pres.-Electronic, Atomic & Defense Systems Group, General Electric Co., 570 Lexington Ave., New York 22, N. Y.

LARDNER, THOMAS, (s) Polytechnic Institute of Brooklyn, Brooklyn, N. Y. Home: 745 President St., Brooklyn 15, N. Y.

LARGE, CHARLES B., (m) Mgr., Quality Control, Aerojet-General Corp., P.O. Box 1168, Sacramento, Calif. Home: 2570 Las Pasas Way, Sacramento, Calif.

LARSON, KENNETH B., (s) Mass. Inst. of Technology, Cambridge, Mass. Home: 414 Beacon St., Boston 15, Mass.

LARSON, VERNON R., (m) Res. Engr., Preliminary Design, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: Box 392-B, RFD #1, Camarillo, Calif.

LASKI, EDWIN C., (m) Regional Representative, Sales Division, Aerojet-General Corp., Amon Carter Field, Ft. Worth, Tex. Home: 3716 Scranton Dr., Ft. Worth 11, Tex.

LAVELLE, JOSEPH E., (m) Des. Engr., Pratt & Whitney Aircraft Corp., 150 Causeway St., Boston, Mass. Home: 25 Devonshire Rd., Waben, Mass.

LAW, GEORGE H., (m) Director of Research, Carbide & Carbon Chemicals Co., 30 E. 42nd St., N. Y. 17, N. Y. Home: 22 Benjamin St., Old Greenwich, Conn.

LAWRENCE, HAMILTON, (a) Colonel, United States Marine Corps, Naval Auxiliary Air Station, Edenton, N. C. Home: 901 Cabarrus St., Edenton, N. C.

LAWRENCE, HERBERT R., (m) Associate Director, Propulsion & Structures, Guided Missile Research Division, Ramo-Wooldridge Corporation, 5760 Arbor Vitae, Los Angeles 45, Calif. Home: 673 Erskine Dr., Pacific Palisades, Calif.

LAWRENCE, HEWSON, (m) Aerojet-General Corp., Sacramento, Calif. Home: 800 Larch Lane, Sacramento, Calif.

LAWRENCE, JOHN O., (m) Chief, Plant Security Department, Thiokol Chemical Corporation, Redstone Div., Huntsville, Ala. Home: 412 Eustis St., Huntsville, Ala.

LAWRENCE, LOVELL, JR., (m) Head, Power Plant Design, Chrsyler Corp., Missiles Br., P. O. Box 2628, Detroit, Mich. Home: 955 Harcourt Rd., Grosse Point Park, Mich.

LAWRENCE, RALPH W., (m) Assistant Sr. Chemist, Chemical Dept., Aerojet-General Corp., Azusa, Calif. Home: 821 E. Bennett, Glendora, Calif.

LAWRENCE, ROBERT M., Assistant Treasurer, Finance Division, Reaction Motors, Inc., Denville, N. J. Home: 41 Cedar Place, Packanack Lake, N. J.

LAWRENCE, WILLIAM H., (m) General Engr., Rocket Engine Test Center, FTRO, Edwards Air Force Base, Calif. Home: 44937—5th Ave. E., Lancaster, Calif.

LAWSON, LORETTA F., (a) Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 11901 Arminta St., North Hollywood, Calif.

LAY, MANCHIU D. S., (a) Teaching-Fellow, Univ. of Michigan, Chem. Engng. Dept., Ann Arbor, Mich. Home: 927 Sylvan, Ann Arbor, Mich.

LAYS, EDWARD, JR., (m) Sr. Aerodynamics Engr., North American Aviation, Inc., 4300 E. 5th Ave., Columbus 16, O. Home: 898 Bucknell Rd., Columbus 13, O.

LAYTON, JAMES P., (m) Chief Jet Propulsion Research Engr., Department of Aeronautical Engng., James Forrestal Research Center, Princeton University, Princeton, N. J. Home: Forrestal House 5A, Aqueduct, R.D. 3, Princeton, N. J.

LAZO, LUIS R., (m) Jet Div., Thompson Products Co., 12818 Coit Rd., Cleveland, O. Home: 302 Natel Dr., Euclid 23, O.

LEA, RICHARD C., (m) Group Eng. II, The Glenn L. Martin Co., Denver, Colo. Home: 2510 S. Wolff St., Denver, Colo.

LEANDER, HUGO A., (m) President, The W. L. Maxson Corporation, 460 West 34th St., New York 1, N. Y. Home: 40 Park Ave., New York 16, N. Y.

LEAR, CHARLES W., (s) University of California, Berkeley, Calif. Home: 225C Carolina St., Vallejo, Calif.

LECAT, ROBERT J., (m) Associate Engr., Aerodynamics Group, Applied Physics Lab., Johns Hopkins University, 8621 Georgia Ave., Silver Spring, Md. Home: 10204 Carroll Pl., Kensington, Md.

LEE, DAVID A., (m) Design Engr., Firestone Tire and Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 6728 W. Blvd., Los Angeles 43, Calif.

LEE, FREEMAN G., (m) Glenn L. Martin Co., Baltimore, Md. Home: 938 Garden Dr., Baltimore 3, Md.

LEE, JOHN G., (a) Director of Research, United Aircraft Corp., East Hartford, Conn.

LEE, ROBERT J., (a) Electrical Engr., Melpar, Inc., 3000 Arlington Blvd., Falls Church, Va. Home: 4514 Conn. Ave. N.W., Apt. 203, Washington, D. C.

LEFER, HENRY, (a) Associate Editor, Aviation Week Magazine, 330 W. 42nd St., New York 36, N. Y. Home: 11 Stuyvesant Oval, New York 9, N. Y.

LE FROIS, RICHARD T., (s) Device Development Technician, Semiconductor Department, Westinghouse Electric Corp., Youngwood, Penn. Home: 205 Bryant Dr., Pittsburgh 35, Penna.

LEHAN, FRANK W., (m) Assoc. Director, Electronics Res. & Dev. Staff, Guided Missile Res. Div., Ramo-Wooldridge Corp., 5670 Arbor Vitae, Los Angeles 45, Calif. Home: 713 Tufts Ave., Burbank, Calif.

LEHRER, STANLEY, (m) Proj. Engr., Experimental Projects Dept., Reaction Motors, Inc., Denville, N. J. Home: 115 Central Ave., Pompton Lakes, N. J.

LIEBERMAN, SEYMOUR, Associate Research Engineer, Turbo-Engineering Division, American Machine & Foundry, 12270 Montague St., Pacoima, Calif. Home: 15060 Encanto Dr., Sherman Oaks, Calif.

LEIBSON, MELVIN J., (s) Res. Assistant, Chemical Engng. Dept., Syracuse University, Syracuse 10, N. Y. Home: 2400 Walton Ave., New York 68, N. Y.

LEISZ, GEORGE W., (m) Instrumentation Supervisor, Autonetics, A Division of North American Aviation, Inc., 12214 Lakewood Bldg., Downey, Calif. Home: 11104 E. Dunning St., Norwalk, Calif.

LEITCH, DONALD M., (m) Supervisor-Armament Rockets Design & Dev., Rocketdyne, A Division of North American Aviation, Inc., Canoga Ave., Canoga Park Calif. Home: 4819 Escobedo Dr., Woodland Hills, Calif.

LEMBECK, WILLIAM, (s) Partner-Design Engr., Assembled Products Co., 43 Harriet Place, Lynbrook, N. Y. Home: 34 Sloan Dr., Valley Stream, N. Y.

LEMMERMAN, CARL W., (a) Consultant, Industrial Sound Control Dept., Koppers Co., Inc., 111 Lafayette St., Hartford, Conn. Home: 39 Waterside Lane, W. Hartford, Conn.

LEMMON, ALEXIS W., JR., (m) Assistant Chief, Chemical Engng. Res., Battelle Institute, 505 King Ave., Columbus 1, O. Home: 1334 Arlington Ave., Columbus 12, O.

LEMNITZER, WILLIAM L., (m) Graduate Student, Columbia Univ. Student Detachment Hq., First Army, U. S. Army, Governors Island, New York, N. Y. Home: 680 Poly Place, Brooklyn 9, N. Y.

LENEHAN, ARTHUR E., (a) Supervisory Chemical Engr., Rocket Propellant Unit, Engng. Branch, Army Ordnance Ammunition Command, Joliet, Ill. Home: 622 S. Lyman Ave., Oak Park, Ill.

LENNON, WILLIAM E., (m) Sr. Co-Ordinator & Expeditor, Bell Aircraft Corp., Rocket Div., P. O. Box 1, Buffalo 5, N. Y. Home: 43 Jewett Parkway, Buffalo 14, N. Y.

LENT, ROBERT R., (m) Washington Representative, Reaction Motors, Inc., 1833 Jefferson Pl., N.W., Washington, D. C. Home: 1065 Quander Rd., Alexandria, Va.

LEONARD, ARTHUR S., (m) Dept. of Agricultural Engineering, University of California, Davis, Calif. Home: 815 Douglas Ave., Davis, Calif.

LESCHER, GEORGE W., (m) Chairman of Projects Evaluation Board, Management Staff, Fairchild Aircraft Div., Fairchild Engine & Airplane Corp., Hagerstown, Md. Home: 729 Orchard Rd., Hagerstown, Md.

LESSING, CALVIN G., (m) Assist Mathematician, Missile Section, Bendix Products Div., Mishawaka, Ind. Home: 1014 Salameda, Las Cruces, N. M.

LESSLEY, ROBERT L., (m) Development Engr., Liquid Engines Division, Aerojet-General Corp., Azusa, Calif. Home: 479 S. Carleton Ave., Claremont, Calif.

LESTER, WM. A., (m) Sr. Design Engr., Propulsion Group, Convair, A Division of General Dynamics Corp., Pacific Hgwy., San Diego 12, Calif. Home: P. O. Box 222, Del Mar, Calif.

LESZYNSKI, STANLEY W., (m) Research Engr. A, Pilotless Aircraft Division, Boeing Airplane Co., Box 3107, Seattle 14, Wash. Home: 8627 24th Ave., S.W., Seattle 6, Wash.

LEVENSON, LEONARD LIONEL, (s) Graduate Research Engr., University of California, Berkeley, Calif. Home: 3127 Brookdale Ave., Oakland 2, Calif.

LEVENSON, ROBERT S., (a) Mech. Engr., Engng. Dept., Henry Products Company, 842 Rockaway Ave., Brooklyn 12, N. Y. Home: 78 Northern Pkwy, Plainview, L. I.

LEVIN, ALEXANDER, (m) Chief, Supervisory Mech. Engr., Supporting Research Branch, Mechanical Engng., Div., QM, R. and D. Center, Natick, Mass. Home: 18 Lilian Rd., Framingham, Mass.

LEVINE, ARNOLD, (m) Director, Guided Missile Laboratory, Federal Telecommunication Laboratories, A Division of International Telephone & Telegraph Corporation, 492 River Rd., Nutley 10, N. J. Home: 154 Lozier Terrace, River Edge., N. J.

LEVINE, R., (m) Dir. of Design and Appl. Engng., Norden-Ketay Corp., Home: 99 Park Ave., New York 16, N. J.

LEVINE, ROBERT S., (m) Assist. Group Leader, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 13341 Martha St., Van Nuys, Calif.

LEVITT, I. M., (m) Director, The Fels Planetarium, The Franklin Institute, Philadelphia 3, Pa. Home: 7558 Greenhill Rd., Philadelphia 31, Pa.

LEVY, LAWRENCE, (m) President, Allied Research Associates, Inc., 43 Leon St., Boston 15, Mass.

LEWE, CHONG K., (s) Whitman College, Box 468, Walla Walla, Wash.

LEWINSKI, STANLEY F., (m) Rocket Installations Engr., Rocket Department, Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 324 Darlington Dr., Buffalo 23, N. Y.

LEWIS, ALBERT C., (m) Military Sales Rep., Hughes Aircraft Co., Culver City, Calif. Home: 6501 Corbin Ave., Canoga Park, Calif.

LEWIS, DONALD W., (m) Res. Engr., North American Aviation, Inc., 6349 E. Slauson Ave., Los Angeles, Calif. Home: 967 S. Simmons Ave., Los Angeles 22, Calif.

LEWIS, GLENN H., (m) Home: P.O. Box 815, Blythe, Calif.

LEWIS, RAYMOND J., (m) General Technician Supervisor, Bell Aircraft Corp., Rocket Div., P.O. Box 1, Buffalo 5, N. Y. Home: Ward Rd., R.D. #2, Sanborn, N. Y.

LEWIS, RICHARD B., (m) Supervisor, Missile Test Engng., Missile Flight Test, Northrop Aircraft Inc., Patrick Air Force Base, Fla. Home: 100 8th Ave. (Indialantic) Melbourne, Fla.

LEY, WILLY, (a) Home: 37-26—77th St., Jackson Heights 72, N. Y.

LI, YAO T., (m) Associate Professor, Massachusetts Institute of Tech., Cambridge, Mass. Home: 28 Orchard St., Watertown, Mass.

LIBERATORE, EUGENE K., (a) Assistant Director of Engng., Flettner Aircraft Corp., 120-33 83rd Ave., Kew Gardens 15, N. Y. Home: 76 East End Ave., Hicksville, N. Y.

LIDDLE, SIDNEY G., (s) University of Utah, Salt Lake City, Utah. Home: 1858 South Fourth East, Salt Lake City, Utah.

LIBERMAN, DAVID, (s) Senior Res. Engr., Combustion Devices Group, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 1102 W. 138 Place, Hawthorne, Calif.

LICHTENSTEIN, IMMANUEL, (m) Tech. Asst. to V. P. of Research, Research and Advanced Development Div., Avco Manufacturing Corp., Stratford, Conn. Home: 276 Riverside Dr., N. Y. 25, N. Y.

LIEBERMAN, PAUL, 2/Lt. (s) Proj. Engr., Captive Flight Section, Rocket Engine Test Laboratory, Edwards Air Force Base, Calif. Home: 44821 Trevor Ave., Lancaster, Calif.

LIEBERMAN, SEYMOUR, (m) Res. Engr., Rocket Eng. Div., North American Aviation, Inc., Slawson Ave., Maywood, Calif. Home: 15060 Encanto Dr., Sherman Oaks, Calif.

LIEBERSTEIN, MELVIN, (m) Aeronautical Research Scientist, NACA, 21000 Brook Park Rd., Cleveland, O. Home: 16719 Sedalia Ave., Cleveland, O.

LIETZ, ARNOLD R., (m) Chief Engr., Missile and Aircraft Division, Control Engineering Co., 8900 Alpine Ave., Detroit 4, Mich. Home: 1513 N. Blair, Royal Oak, Mich.

LIGHTBROWN, L. E., (m) Design Group Engr., Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 4117 Mattison, Ft. Worth, Tex.

LILJEGREN, LYLE K., (m) Ordnance Design Engr., Los Angeles Ordnance District, Dept. of Army, 55 So. Grand, Pasadena, Calif. Home: 1730 Casa Grande, Pasadena, Calif.

LILLEY, HOLLIS B., (m) Electronic Specialist, Instrumentation & Standards Br., White Sands Proving Ground, N. M. Home: 405 Madrid Rd., Las Cruces, N. M.

LIM, DAVID P., (a) Hughes Aircraft Co., Tucson, Ariz. Home: 5650 E. 24th St., Tucson, Ariz.

LINDBERG, PAUL A., (s) University of Minnesota, Minneapolis, Minn. Home: 130 Fifth Ave. N., Virginia, Minn.

LINDSTROM, ROBERT E., (m) Assistant Chief, Structures & Mechanics Branch, Army Ballistic Missiles Agency, Huntsville, Ala. Home: 74 Bide Wee Dr., Huntsville, Ala.

LINK, ARTHUR C., (m) Project Mgr., Radio Div., Western Electric Co., Inc., 120 Broadway, New York 5, N. Y. Home: 12 Knollwood Dr., Larchmont, N. Y.

LINNELL, RICHARD D., (a) Functional Engr., Special Defense Projects Dept., General Electric Company, Schenectady, N. Y. Home: 2212 Clifton Park Rd., Schenectady 9, N. Y.

LINSE, ROBERT E., (m) Supervisor, Combustion Devices, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 17421 Lahey St., Granada Hills, Calif.

LINSK, LEO, (a) Office of the Inspector of Naval Material, Naval Industrial Reserve Shipyard, Port Newark, N. J. Home: 13-24A Sperber Rd., Fairlawn, N. J.

LINTELMAN, WILLY, (s) U,S.N., ATA School, Bks. 5-238, Wy., NATTC, Memphis 15, Tenn. Home: Ayers Point Rd., Old Saybrook, Conn.

LITT, WILLIAM, (a) Aerojet-General Corp., Azusa, Calif. Home: 1544 Bonnie Brae St., Pomona, Calif.

LITTELL, CHARLES C., JR., (m) President & Chief Engr., Engineering Associates, 434 Patterson Rd., Dayton 9, O.

LIU, FREDERICK F., Senior Res. Scientist and Research Engng. Specialist, Rocketdyne, A Division of North American Aviation, Inc., Canoga Ave., Canoga Park, Calif. Home: 7434 Danby Ave., Reseda, Calif.

LIU, TUNG-SHENQ, (m) Scientist, Aero. Res. Laboratory, Univ. of Minn., Rosemount, Minn. Home: Staff House #6, Univ. of Minn., Rosemount, Minn.

LIVINGSTON, FRANK W., (m) Des. Engr. "B", Thrust Chamber Dept., Aerojet-General Corp., Sacramento, Calif. Home: 7104 Cardinal Rd., Fair Oaks, Calif.

LJUBENKO, DUSAN J., (m) Ass't. Purchasing Agent, Purchasing Dept., Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill. Home: 2425 N. Clybourn Ave., Chicago 14, Ill.

LLEWELLYN, JAMES M., JR., (s) Parks College of St. Louis Univ., E. St. Louis, Ill. Home: 2307 So. "M", Ft. Smith, Ark.

LLOBET, ANDRES FRANCISCO, (m) Engr. Estancias Llobet Cullen, Buenos Aires, Argentina. Home: Juncal 1081, Buenos Aires, Arg.

LOCKE, ARTHUR A., (m) Prof. & Hd. Dept. of Aeronautical Engng., Wayne University, Detroit 1, Mich. Home: 4887 Pointe Tremble Rd., Algonac, Mich.

LOENING, GROVER, (m) Consultant, NACA. Home: 24 W. 55th St., New York City, N. Y.

LOGAN, STANLEY E., (m) Engr., Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill. Home: 5933 Newburg Ave., Chicago 31, Ill.

LONG, DAVID E., (m) Aerodynamics Engr., Research Div., Marquardt Aircraft Co., Saticoy St., Van Nuys, Calif. Home: 6330 W. Olympic Blvd., Los Angeles 48, Calif.

LONG, C. MARVIN, (m) Research Engr., Power Plant Staff, Boeing Airplane Co., Wichita, Kans. Home: 2338 Geo. Wash. Dr., Wichita 17, Kans.

LONG, PALMER L., (m) Flight Test & Res. Engr., A & D Aircraft, Douglas Aircraft Co., Edwards AFB, Edwards, Calif. Home: 44142 N. Elm Ave., Lancaster, Calif.

LONG, SAM A., (m) Chief Chemist, Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 109 Hawley St., Buffalo 13, N. Y.

LONGWELL, JOHN P., (m) Head, Process Research Sect., Esso Research and Engng. Co., Box 121, Linden, N. J. Home: 1110 Maple Hill Rd., Westfield, N. J.

LONGYEAR, ALFRED B., (m) Tech. Rep., Management Dept., Aerojet-General Corp., Rm. 704 American Bldg., Dayton, O. Home: 5861 Freeman Rd., Dayton 9, O.

LONON, DAVID N. III, (m) Engr., Rocket Section, General Electric Co., Bldg. 600, Evendale Plant, Cincinnati, O. Home 6224 Wiehe Rd., Cincinnati 13, O.

LOOMIS, RALPH W., (m) Supervising Engr., Missile Operations Div., Chrysler Corp., Box 2628, Detroit 31, Mich. Home: 1444 Stanley Blvd., Birmingham, Mich.

LOPEZ, HENRY J., (s) Research Assist. Rensselaer Polytechnic Inst., Troy, N. Y. Home: 595 Congress St., Troy, N. Y.

LORDI, NICHOLAS G., (s) Graduate Student, Purdue Univ., W. Lafayette, Ind. Home: 759 Springfield Ave., Irvington 11, N. J.

LORENZO, CARL F., (s) Fenn College, E. 24th and Euclid Ave., Cleveland, O. Home: 1743 Donwell Dr., S. Euclid 21, O.

LORMAN, EDMUND F., (m) Senior Engr., Test and Field Service, Aerojet-General Corp., 6352 North Irwindale Ave., Azusa, Calif. Home: 458 North Primrose Ave., Monrovia, Calif.

LOTT, G. RICHARD, (m) Dayton Representative, Reaction Motors, Inc., 1300 American Bldg., Dayton 2, O. Home: 360 Forrer Blvd., Dayton 9, O.

LOUGHLIN, ROBERT W., (a) 1st Lt., Ord. Corps, U. S. Army, RALO, BTL, Whippany, N. J. Home: Franklin Village, Morristown, N. J.

LOVE, CHARLES C., (m) Sr. Engr., Convair, A Division of General Dynamics Corp., 4467 Santa Cruz Ave., San Diego, Calif.

LOVELACE RANDOLPH W. III, (a) Director, Lovelace Fndn. for Medical Ed. & Research, 4800 Gibson Blvd., S.E., Albuquerque, N. M. Home: 2815 Ridgecrest Dr., S.E., Albuquerque, N. M.

LOWENTHAL, WILLIAM S., (s) University of Miami, Coral Gables, Fla. Home: 7513 Cutlass Ave., Miami Beach, Fla.

LOWRY, ROBERT K., (m) Devel. Engr., Preliminary Design, Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 4145 Elmer Ave., N. Hollywood, Calif.

LOY, CARL A., (m) Associate Engr., Missile Section, Bendix Products Div., Bendix Aviation Corp., 400 So. Beiger St., Mishawaka, Ind. Home: R.F.D. Ft. Laramie, O.

LUBOYESKI, S. R., (s) White Sands Proving Ground, N. M. Home: c/o Mrs. H. Brooks, 513 East Rd., Bristol, Conn.

LUCAS, HENRY A., (m) Senior Test Engr., Rocket Division, Bell Aircraft Corp., Buffalo, N. Y. Home: 35 Sunnydale Dr., Tonawanda, N. Y.

LUCHTER, DANIEL, (m) Electronic Engr., EML Instrumentation, WSPG, N. M. Home: 1014 Myrtle, El Paso, Tex.

LUCKEN, ERNEST G., (m) Sr. Engr., Solid Engine Division, Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 3176 La Tierra St., Pasadena, Calif.

LUCUS, JAMES W., (a) Physics Instructor, Dusable High School, 4939 Wabash Ave., Chicago, Ill. Home: 6210 Rhodes Ave., Chicago, Ill.

LUDWIG, JOHN W., (m) Supervisor, Design Group Development Sect., Chance Vought Aircraft Co., Dallas, Tex. Home: 11606 Strand St., Dallas, Tex.

LUECHT, JOHN W., (m) Genr'l. Spvsr., Advanced Design, Missile Br., Chrysler Corp., P. O. Box 2628, Detroit 31, Mich. Home: 6619 Hendrie Blvd., Royal Oak, Mich.

LUGO, FRANCISCO ANICETO, (m) Estudio Lugo. Home: Avenida Norte N. 70, Edif. La Trinidad 2, piso. Caracas, Venezuela.

LUHRMANN, GEORGE W., JR., (s) Massachusetts Inst. of Technology, Cambridge Mass. Home: Blue Anchor Rd., Cedar Brook, N. J.

LUKAS, FRANCIS S., (m) Buying Supervisor, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 5429 Waltham, Ft. Worth, Tex.

LUSKIN, HAROLD, (m) Assist. Ch. of Aerodynamics, Douglas Aircraft Co., Inc., Santa Monica, Calif. Home: 11260 Chalon Rd., Los Angeles 49, Calif.

LUTHER, KENNETH R., President, The Eadar Co., Box 304, Van Nuys, Calif. Home: 15757 Sylvan St., Van Nuys, Calif.

LYNCH, JAMES R., (m) Contract Coordinator, Contract Administration Div., Aerojet-General Corporation, 6352 Irwindale, Azusa, Calif. Home: 1528 Elmcrest St., La Verne, Calif.

LYNCH, THOMAS E., (m) Vice Pres., Director of Ordnance Products, Clevite Research Center, Div. of Clevite Corp., 540 E. 105th St., Cleveland 8, O. Home: 3120 E. 135th St., Cleveland 20, O.

LYNCH, WILLIAM J., (a) Lt. Col., U. S. Army, Office Deputy Chief of Staff for Logistics, The Pentagon, Washington 25, D. C. Home: 6820—25th St., Arlington 13, Va.

LYNCH, WILLIAM L., (m) 1st Lt., Sig. C., Instructor, Unit Chief, Ground Guidance Branch, SAM Division, Ordnance Guided Missile School, 9615 TW, OGMS, Redstone Arsenal, Huntsville, Ala. Home: 500-C Crozier Dr., Huntsville, Ala.

LYNN, GEORGE A., (s) Systems Engr., Electronic Production Product Engng., Crosley, Div. of Avco Mfg. Corp., 2630 Glendale-Milford Rd., Cincinnati, O. Home: 1845-C Chaucer Dr., Cincinnati 37, O.

LYONS, HAROLD R., (m) Product Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 82 Woodland Rd., Short Hills, N. J.

LYPE, ERIC F., Thermodynamicist, Aircraft Gas Turbine Div., General Electric Co., Cincinnati 15, O. Home: 5027 Reading Rd., Cincinnati 37, O.

M

McADORY, JOHN L., JR., (m) Electronic Specialist, Electronic Warfare Div., WSSCA, White Sands Proving Ground, N. M. Home: 2020 Princess Jeanne, Las Cruces, N. M.

McALEVY, ROBERT F., III (s) Graduate College, Princeton University, Princeton, N. J. Home: 1204 Bloomfield St., Hoboken, N. J.

McALLISTER, THOMAS R., (s) Purdue Univ., W. Lafayette, Ind. Home: 618 Evergreen St., W. Lafayette, Ind.

McBRIDE, FRANK E., (m) Supervisor of Project Engng., Assembly Division, Missile Operations, Chrysler Corp., P. O. Box 2628, Detroit 31, Mich. Home: 633 North Eton Rd., Birmingham, Mich.

McBRIDE, JOHN A., (m) Mgr., Development Br., Rocket Fuels Div., Phillips Petroleum Co., Box 548, McGregor, Tex. Home: 3805 Erath Ave., Waco, Tex.

McCALLUM, DOUGALL, (m) Engr., Missiles-Power Plant, Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 927 Kagawa St., Pacific Palisades, Calif.

McCANDLESS, EDWARD L., (m) Assist. Dir. of Research, Linde Air Products Co., Tonawanda, N. Y. Home: 55 Doncaster Rd., Kenmore 17, N. Y.

McLARD, TRUMAN E., (m) Test Engr., Test & Eval. Br., Rocket Dev. Div., Redstone Arsenal, Huntsville, Ala. Home: 521 Locust St., Huntsville, Ala.

McCLINTOCK, DARWIN G., (a) Res. Engr., Field Service and Support Division, Hughes Aircraft Company, Florence and Teale Sts., Culver City, Calif. Home: 7544 West 90th St., Los Angeles 45, Calif.

McCLINTOCK, ROBERT, (s) Engr. Structures, Engng., North American Aviation, Inc., 4300 East 5th Ave., Columbus, O. Home: 344-19 St., Brooklyn 15, N. Y.

McCLOSKEY, CHESTER M., (m) Chief Scientist, Office of Naval Research, 1030 E. Green St., Pasadena 4, Calif. Home: 1981 Sincloa Ave., Altadena, Calif.

McCORD, WILLIAM M., (m) Electronic Engng. Section, Guided Missile Div., Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 675 Loranne Ave., Romona, Calif.

McCORMICK, DONALD A., (m) President, McCormick Selph Associates, Inc., Hollister Airport, Hollister, Calif. Home: Santa Anita Ranch, Tres Pinos, Calif.

McCOURT, ANDREW W., (m) Manager, Analytical Section, Air Arm Division, Westinghouse Electric Corp., Friendship Airport, Baltimore 27, Md. Home: 16 Mansion Rd., North Linthicum, Md.

McCREERY, FRANK E., (m) Vice President, Engng., Rohr Aircraft Corporation, "H" St., Chula Vista, Calif. Home: 10381 Spur Ct., La Mesa, Calif.

McCROCKLIN, ROBERT EARL, (m) Devel. Test Specialist, Consultants & Designers, Inc., 650 — 11th Ave., New York 36, N. Y. Home: Box 784, Terre Haute, Ind.

McCURDY, JOHN A., (m) Electronics Engr., Technical Analysis Div., Holloman Air Force Base, N. M. Home: 503 16th St., Alamogordo, N. M.

McDANIEL, CHARLES R., (a) Internal Guidance System Repairman (Nike), 4055th SU 1st Guided Missile Brigade, U. S. Army, Fort Bliss, Texas. Home: 427 N. Jefferson, Indianapolis 1, Ind.

McDANIEL, KEITH K., (m) Field Test Director, Pilotless Aircraft Div., Boeing Airplane Co., Box 97, Melbourne Fla. Home: Indialantic, Melbourne, Fla.

McDONALD, JOHN R., (a) USAF. Home: 403 Morningside NE, Albuquerque, N. Mex.

McDONNELL, SANFORD N., (m) Group Engr., Airplane Engng. Division, McDonnell Aircraft Corp., Lambert Airport, St. Louis, Mo. Home: 131 Stoneleigh Towers, St. Louis 24, Mo.

McDOWALL, CHARLES J., (m) Chief Engr., Advance Design and Development, Allison Division, General Motors Corporation, Post Office Box 894, Indianapolis 6, Ind. Home: RR 17, Box 360, Indianapolis, Ind.

McDOWELL, DONALD R., (m) Publications Mgr., Guided Missile Res. Div., Ramo-Wooldridge Corp., 5780 Arbor Vitae St., Los Angeles 45, Calif. Home: 4225 Via Pinzon, Palos Verdes Estates, Calif.

McEWAN, RICHARD G., (m) Lt. Col., Guided Missile Officer, Hq. 52nd AAA Brigade, U. S. Army, Ft. Wadsworth, New York. Home: Qtrs. 8A, Ft. Wadsworth, N. Y.

McFARLAND, STANLEY, (s) Indiana Technical College, 223 E. Washington St., Fort Wayne, Ind. Home: 1151 Tompkins St., St. Charles, Mo.

McGEE, HENRY I., (m) Pres., Texas Metal and Manufacturing Co., Inc., 6114 Forest Park Rd., Dallas, Tex.

McGILL, HOWARD L., (m) Projects Coordinator, Research Division, Rohm & Haas Company, Redstone Arsenal, Huntsville, Ala. Home: 521 Lowell Drive, Huntsville, Ala.

McGINTY, WALTER F., (m) Sales Engr., Parker Aircraft Company, 5827 W. Century Blvd., Los Angeles 45, Calif. Home: 423 Ocean Ave., Santa Monica, Calif.

McGUIRE, ROBERT W., (a) Engineering Aid, Pasadena Annex, U. S. NOTS, 3202 E. Foothill Blvd., Pasadena, Calif. Home: 290 No. Euclid Ave., Apt. 307, Pasadena, Calif.

McHUGH, WALTER M., (m) Sr. Electronic Engr., Firestone Tire & Rubber Co., Los Angeles, Calif. Home: 1730 4th St., San Pedro, Calif.

McINTYRE, ROBERT B., (a) Advertising News Editor, Editor & Publisher Co., 1475 Broadway, New York 36, N. Y. Home: 9 Leslie Rd., Tuckahoe 7, N. Y.

McISAAC, Jr. JOHN M., (m) Lieutenant (junior grade), U. S. Navy, Guided Missile Instructor, F.A.D.T.C., Dam Neck, Virginia Beach, Va. Home: 3850 Tunlaw Road (613) N.W., Washington 7, D. C.

McKEE, O. GRADY, Jr., (m) Project Engr., Advanced Engines Dept., Wright Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J. Home: 313 South Drive, Paramus, N. J.

McKENNA, RICHARD P., (a) Technical Writer, Remington Rand, 315 Fourth Ave., New York 10, N. Y. Home: 26 Bayside Drive, Atlantic Highlands, N. J.

McKENNEY, HENRY, (m) Chief Engr., Ford Instrument Co., a Division of Sperry-Rand Corp., 31-10 Thomson Ave., Long Island City, N. Y. Home: Richmond Hill Rd., Greenwich, Conn.

McKEVITT, FRANK X., Design Engineer "B", Liquid Engine Div., Aerojet-General Corporation, Azusa, Calif. Home: 333 South Lincoln Place, Monrovia, Calif.

McKEY, DIXIE B., (a) Regional Mgr., Government and Industrial, Philco Corporation, 10589 Santa Monica Blvd., Los Angeles 25, Calif. Home: 10451 Ashton St., Los Angeles, Calif.

McKIERNAN, JAMES D., (m) Proj. Engr., M. W. Kellogg Co., Danforth Avenue, Jersey City, N. J. Home: 82 Fenimore St., Brooklyn 25, N. Y.

McKINNEY, C. Dana, Jr., (m) Technical Director, Allegany Ballistics Laboratory, Hercules Powder Company, Box 210, Cumberland, Md. Home: Route 1, Lavale Court, Cumberland, Md.

McLAIN, JOSEPH H., (m) Consultant, Olin Mathieson Chem. Corp., 460 Park Ave., New York 22, N. Y. Home: Box 44 Chestertown, Md.

McLAREN, KENNETH M., (m) Mgr., Planning and Analysis Section, Missile Test Project, RCA Service Co., Inc., Patrick Air Force Base, Florida. Home: P. O. Box 447, Cocoa Beach, Fla.

McLARIN, MAITLAND, (m) Flight Test Instrumentation Engr. (Telemetry), Field Operations (F102 Project), Dept. 303, Convair, A Division of General Dynamics Corp., P. O. Box 111, Edwards, Calif. Home: 38363 Rose Marie St., Palmdale, Calif.

McLASKEY, VERNON A., (m) Development Engr. "A", Test Dept., Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 5844 99rd Ave., Sacramento, Calif.

McLEAN, JAMES D., (m) Vice-President—Government & Industrial Division, Philco Corporation, 4700 Wissahickon Ave., Philadelphia 44, Pa. Home: Rydal Road, Rydal, Pa.

McLEAN, WILLIAM B., (m) Technical Director, U. S. NOTS, China Lake, Calif. Home: 510 Lexington, China Lake, Calif.

McLEARIE, JOHN R., (m) Senior Buyer, LRP, Aerojet-General Corporation, Sacramento, Calif. Home: 4412 Crestridge Road, Fair Oaks, Calif.

McLEOD, JOHN F., (m) Owner, Brown's Camera Store, 118 W. Bay St., Jacksonville, Fla. Home: 1238 Cook St., Jacksonville 5, Fla.

McMAHAN, P. COLIN, (s) Ensign, U.S.N., BOQ Saveley Field, Pensacola, Fla. Home: 30 Jefferson St., Allenport, Pa.

McMAHILL, VICTOR W., Jr., (m) Contracts Mgr., Experiment, Incorporated, Richmond 2, Va. Home: 1200-A Willow Lawn, Richmond 26, Va.

McMILLAN, WILLIAM C., (m) Major, Ordnance Corps, U. S. Army, Det. "F", Kmag. 8202AU, APO 102, San Francisco, Calif. Home: RR #1, Mount Carmel, Ill.

McMURTREY, LAWRENCE J., (m) Res. Specialist, Power Plant Staff, Boeing Airplane Co., Wichita, Kans. Home: 1949 S. Old Manor Rd., Wichita 18, Kans.

McNAUGHTON, ANDREW G. L., (m) General, Chairman, Canadian Sections, Canada-United States Permanent Joint Board on Defence and International Joint Commission, Government of Canada, Justice Bldg., Wellington St., Ottawa. Home: 393 Fernbank Rd., Rockcliffe, Ottawa 2, Ontario.

McTIGUE, GEORGE J., (m) Mgr., Central Dist., Avia. & Defense Industry Sales, General Electric Co., 2600 Far Hills Ave., Dayton 9, Ohio. Home: 107 Sherbrooke Dr., Dayton 9, O.

McVEY, JOHN F., (s) U. S. Air Force, 380 FMS, Plattsburgh Air Force Base, N. Y.

McWILLIAMS, CARLTON L., (m) Supervisor, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 10615 Louise Ave., Granada Hills, Calif.

MABERY, HENRY N., (m) Mgr., Pacific District, Robbins and Associates, 1735 W. Florence Ave., Los Angeles 47, Calif. Home: 2370 Montrose Ave., Montrose, Calif.

MACAARON, KENNETH A., (m) Major U.S.A.F., Holloman Air Dev. Center, Holloman AFB, N. M. Home: 1307 Greenwood Lane, Alamogordo, N. M.

MACAFEE, IRVIN M., Jr., (s) Res. Assist., Chemical Engng., Syracuse University, Collendale D-2, Syracuse 10, N. Y. Home: Milan, Pa.

MACCARONE, MICHAEL B., (m) Instructor, Mechanical Engng. Dept., New York University, University Hghts., New York 53, N. Y. Home: 373 County Center Rd., White Plains, N. Y.

MacCORKLE, EMMET WALLACE, Jr., (m) Vice-President, Air Reduction Pacific Co., 2861 Leonis Blvd., Vernon 58, Calif. Home: 1002 Roxbury Road, San Marino 9, Calif.

MacDIARMID, DONALD B., (m) Capt., U. S. Coast Guard. Home: 5023 Kalanianaole Hwy, Honolulu, T. H.

MacDONALD, DENNISON H., (m) Dir. of Res. and Engrg., Revere Corporation of America, 845 N. Colony Rd., Wallingford, Conn. Home: 494 Thompson Ave., E. Haven, Conn.

MacDONALD, FRANK W., (m) Chief Engr., Firestone Tire & Rubber Co., Guided Missile Division, 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 1001 North Hollydale Dr., Fullerton, Calif.

MacDONALD, HUGH J., (m) Guided Missile Design, USAF-ARDC, Holloman AFB, New Mex. Home: 571 - 4th St., Brooklyn 20, N. Y.

MacDONALD, JOHN F., (a) Field Engr. (Nike Missile), Field Engng., Western Electric Co., Inc., Bldg. 15, Ft. Hancock, N. J. Home: Ramapo Rd., Teaneck, N. J.

MacDONALD, VIRGINIA, (a) Engng. Assistant, Light Military Electronic Equipment Dept., General Electric Co., French Road Plant, Utica, N. Y. Home: 308 West Elm St., Oneida, N. Y.

MacEWAN, ROBERT G., (m) Group Leader, Power Plant Design, Missiles Engng., Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 8906 Stewart Ave., Los Angeles 45, Calif.

MacGILL, E. G., (m) Elsie Gregory MacGill, Consulting Engrs., 86 Bloor St. W., Toronto, Ont., Canada. Home: 67 Highbourne Rd., Toronto 7, Ont.

MacGREGOR, ROSS R., (m) Chief Aircraft Process Engr., Aircraft Parts Plant, Kelsey Hayes Wheel Co., 512 N. Wisner, Jackson, Mich. Home: 1015 Westwood Blvd., Jackson, Mich.

MACHLANSKI, SIGMUND H., (m) Sr. Engr., Aerojet-General Corp., Azusa, Calif. Home: 604 E. Whitcomb, Glendora, Calif.

MACHT, STUART M., (m) Engr., Aero-Structures, Aircraft Armaments, Inc., Cockeysville, Md. Home: 4511 Wakefield Rd., Baltimore 16, Md.

MacINTOSH, MARK, (a) Vice-Pres., Traid Corp., 4515 Sepulveda Blvd., Sherman Oaks, Calif. Home: 4730 Burnef Ave., Sherman Oaks, Calif.

MACIULA, L. A., (m) Assist. Mgr., Rocket Fuels Division, Res. and Develop. Dept., Phillips Petroleum Company, Box 548, McGregor, Texas, Home 3809 Erath Ave., Waco, Tex.

MacLEOD, GORDON J., (m) Aerodynamics Engr., Compressor Dept., Propulsion Research Corp., 1860 Franklin St., Santa Monica, Calif. Home: 831 S. Plymouth Blvd., Los Angeles 5, Calif.

MacLEOD, JOHN H., (m) Supervisor, Tech. Personnel Dev. & Placement, General Electric Co., Guided Missiles Dept., 2900 Campbell Ave., Schenectady, N. Y. Home: 1725 Van Antwerp Rd., Schenectady, N. Y.

MacMORRIS, DAVID, (m) Product Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 673 Lakeview Rd., Sparta, N. J.

MacNABB, BYRON G., (m) Operations Mgr., AFMTC, Missile Division, Convair, A Div. of General Dynamics Corp., P. O. Box 274, Cocoa Beach, Fla. Home: 117 S. Atlantic, Cocoa Beach, Fla.

MacPHERSON, GEORGE L., (m) Engr., Aircraft Gas Turbine Div., General Electric Co., Cincinnati 15, O. Home: 604 Orlinda Ave., Scotia, N. Y.

MADDEN, MICHAEL J., (s) Mass. Inst. of Technology, 362 Memorial Drive, Cambridge 39, Mass. Home: 125 E. 72nd St., New York 21, N. Y.

MADDUX, GENE E., (s) Aerodynamicist, Aeroproducts-Allison, Vandalia, O. Home: 409 S. 6th, Tipp City, O.

MADISON, LEE P., (s) University of Minnesota, Minneapolis, Minn. Home: P-32 Univ. Village, Minneapolis 14, Minn.

MAEDER, PAUL F., (c) Prof. of Engng., Division of Engng., Brown University, Providence 12, R. I. Home: 45 Berwick Pl., Rumford 16, R. I.

MAES, MICHEL E., (s) Home: N. 3311 Sheridan Ct., Spokane 14, Wash.

MAGALHAES, JOHN A., (m) Rocket Sect. Engr., Bell Aircraft Corp., Buffalo 5, N. Y. Home: 176 Cleveland Dr., Kenmore 17, N. Y.

MAHAFFY, DWIGHT A., (m) Research Engr., Hughes Aircraft Co., Culver City, Calif. Home: 10207 Darby Ave., Apt. #3, Inglewood, Calif.

MAHONEY, EDWARD A., (m) Hotpoint Company, 5600 Taylor St., Chicago 44, Ill.

MAIN, JOHN H., (m) Tech. Director, Radford Arsenal, Hercules Powder Co., Radford, Va. Home: 600 7th St., Radford, Va.

MAISAK, B. LAWRENCE, (m) Design Engr., Instrumentation, Armament Div., Emerson Elec. Mfg. Co., 8100 W. Florissant, St. Louis 21, Mo. Home: 8945 Boston, Bel-Ridge 21, Mo.

MAISEL, HARRELL, (s) Academy of Aeronautics, LaGuardia Airport, New York. Home: 686 Rockaway Pky., Brooklyn 36, N. Y.

MAJORS, HERBERT H., (s) Home: 315 W. 4th St., Crowley, La.

MALCOLM, JAMES E., (m) Chief, Agents and Techniques Section, Fire Fighting Branch, Engineer Research and Development Laboratories, Fort Belvoir, Va. Home: 6209 - 27th St., N. Arlington 7, Va.

MALE, THEODORE, (a) McCollum & Male, Inc., 14714 Detroit Ave., Lakewood, O. Home: 1310 Warren Rd., Lakewood, O.

MALETZ, MICHAEL, (m) Tech. Specialist, Liquid Engine Division, Aerojet-General Corporation, 6352 N. Irwindale Ave., Box 296, Azusa, Calif. Home: 218 S. Del Mar Ave., San Gabriel, Calif.

MALGERI, THEODORE J., (m) Sr. Test Engr., Experimental Test Engng. Dept., Wright Aero. Div., Curtiss-Wright Corp., Wood-Ridge, N. J. Home: 14 Ferncliff Rd., Bloomfield, N. J.

MALICK, EMIL A., (m) Mgr., Rocket Fuels Division, Phillips Petroleum Company, P. O. Box 548, McGregor, Tex. Home: 3814 N. MacArthur Drive, Waco, Tex.

MALINA, FRANK JOSEPH, (m) Home: 89 Rue Erlanger, Paris 16, France.

MALIS, MICHAEL F., (m) Research Engr., Chicago Midway Lab., 6220 S. Drexel Ave., Chicago, Ill. Home: 2027 W. 175th St., Homewood, Ill.

MALLAN, LLOYD, (m) Science Writer. Home: 2004 Seagirt Ave., Far Rockaway, L. I., N. Y.

MALLAY, JOHN P., (m) Assistant Proj. Engr., Propeller Div., Curtiss-Wright Corp., Caldwell, N. J. Home: 37 Glenbrook Rd., Morris Plains, N. J.

MALMSTROM, CARL R., (a) Assistant Chief Engr., Rheem Mfg. Co., 9236 Hall Road, Downey, Calif. 12323 Ocoso Ave., Whittier, Calif.

MALONEY, CLEMENT G., (a) Special Assistant, Asst. Secretary of the Air Force, Pentagon, Washington, D. C. Home: 441 Vista Drive, Falls Church, Va.

MALONEY, WILLIAM, (m) Thieblot Aircraft Co., Inc., 4924 Hampden La., Bethesda 14, Md. Home: 5403 Cromwell Rd., Washington, D. C.

MALONEY, WILLIAM W., Jr., (m) Draftsman, Avion Instrument Co., A Division of American Car & Foundry Corp., 299 RT-17, Paramus, N. J. Home: 560 E. 26th St., Paterson 4, N. J.

MANDELL, DONALD S., (m) Aerodynamicist, North American Aviation, Inc., Columbus 1, O. Home: 3233 Dale Ave., Columbus 13, O.

MANERA, SALVATORE A., (s) Continental Aviation & Engr. Corp., 12700 Kercheval, Detroit 15, Mich. Home: 15868 Parkside, Detroit 38, Mich.

MANGELS, ALFRED J., (s) Polytechnic Inst. of Brooklyn, 85 Livingston St., B'klyn, N. Y. Home 14 Boylston St., Garden City, N. Y.

MANGUM, BUFORD A., Advertising & Sales Promotion, Heavy Military Electronics Dept., General Electric, Systems Center, Syracuse, N. Y. Home: 162 Anderson Ave., Syracuse, N. Y.

MANES, ROBERT A., (s) Home: 5 Thurton Dr., New Canaan, Conn.

MANION, KATHLEEN M., (a) Arthur D. Little, Inc., 30 Memorial Drive, Cambridge 42, Mass. Home: 8 Forest St., Cambridge 40, Mass.

MANN, CLARENCE H., (a) Secretary, Institute of American Inventors, 631 E. St. N.W., Washington 4, D. C. Home: 4916 Montgomery Lane, Bethesda 14, Md.

MANN, DAVID J., (m) Chief, Propellant Synthesis Dept., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 13 Winans Rd., Livingston, N. J.

MANN, FREDERICK L., Jr., (s) Home: 920 Cornell Ave., Drexel Park, Pa.

MANSFIELD, MALCOLM B., (m) Flight Test Engr., Convair, A Division of General Dynamics Corp., Pacific Highway, San Diego, Calif. Home 4639 Pocahontas Ave., San Diego 17, Calif.

MANSON, SOL E., (a) Home: 199-10 Hillside Ave., Hollis 23, L. I., N. Y.

MANSUR, CHARLES W., (m) Chief, Components Test Section, Rocket Pwr. Plt. Engr., Electro-Mechanical Labs. Div., White Sands Proving Ground, Las Cruces, N. M. Home: 1717 Princess Jeanne Dr., Las Cruces, N. M.

MAPLE, ROBERT L., (m) Executive V.-Pres., Accessory Products Corp., 616 W. Whittier Blvd., Whittier, Calif.

MAR, JAMES W., (a) Assistant Prof., Dept. of Aero. Engng., Massachusetts Institute of Technology, Cambridge, Mass.

MARBLE, DUANE F., (s) Research Assistant, Dept. of Geography, University of Washington, Seattle 5, Wash. Home: 2148 N. 160th, Seattle 3, Wash.

MARCHESE, JOSEPH H., (a) Electronic Engr., Kaman Aircraft Corp., Old Windsor Rd., Bloomfield, Conn. Home: Holmes Circle, R.F.D. #1, Elmwood, Conn.

MARIANO, CHARLES F., (s) Polytechnic Institute of Brooklyn, Brooklyn, N. Y. Home: 20-64 35th St., Long Island City 5, N. Y.

MARCINEK, JACK J., (m) Thermo-Mechanics Group Superv., Convair, A Division of General Dynamics Corp., Pomona, Calif. Home: 1509 N. Caswell, Pomona, Calif.

MARCUM, ELBURN, (m) West Coast Tech. Rep., Electrochemicals Dept., E. I. du Pont de Nemours & Co., P. O. Box 70, El Monte, Calif. Home: 4138 Robin Ave., Baldwin Park, Calif.

MARIE, ROBERT, (a) Electronics Project Engr., OilQuip Division, Perfect Circle Corp., 413 E. Washington Blvd., Ft. Wayne, Ind. Home: Route 1, Huntertown, Ind.

MARINO, EUGENE H., (m) Res. Engr., Boeing Airplane Co., Wichita, Kans. Home: 3030 W. 18th, Wichita, Kans.

MARINO, VINCENT P., (m) Lab. Tech., General Electric Co., Evendale, O. Home: 4818 Oberlin Ave., Cincinnati 37, O.

MARKS, J. DAVID, (m) Consulting Engr., 11 Roosevelt Ave., West Orange, N. J. Home: 11 Roosevelt Ave., West Orange, N. J.

MARKSTEIN, GEORGE H., (m) Head, Combustion Section, Aerodynamic Research Dept., Cornell Aeronautical Laboratory, Inc., 4455 Genesee St., Buffalo 21, N. Y. Home: 612 Tacoma Ave., Buffalo 16, N. Y.

MARMORALE, ANTHONY, (s) Academy of Aeronautics, LaGuardia Airport, New York. Home: 105-03 - 135th St., Richmond Hill, N.Y.

MAROTTA, PATRICK T., (m) President, Marotta Valve Corp., Boonton Ave., Boonton, N. J. Home: 213 Taft St., Boonton, N. J.

MARQUARDT, ROY E., (m) Pres., Marquardt Aircraft Co., 1655 Saticoy St., Van Nuys, Calif. Home: 4697 White Oak Ave., Encino, Calif.

MARQUEZ, SANTOS A., (m) Engr., Venezuelan Air Force, Direccion de los Servicios, Maracay. Home: Apt. 185, Valencia, Venezuela S.A.

MARRONE, PAUL V., (s) Res. Assist., Jet Propulsion Research Program, Forrestal Research Center, Princeton, N. J. Home: 293 North Ave., Niagara Falls, N. Y.

MARSDEN, NORMAN H., (m) Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: Crest Dr., Star Route Malibu, Lakeside, Agoura, Calif.

MARSEL, CHARLES J., (m) Assoc. Prof. Chem. Engng., New York University, N. Y. 53, N. Y. Home: N. Y. U. Faculty Club, New York 53, N. Y.

MARSH, CHARLES F., (m) Department of the Army, 8751 AAU, Box 40, Navy 100, FPO, New York, N. Y.

MARSH, H. W., (m) Sr. Design Engr., Propulsion Center, North American Aviation, Inc., 6349 E. Slauson Ave., Los Angeles, Calif. Home: 20619 Wyandotte, Canoga Park, Calif.

MARSHALL, FRED T., (m) Director, Federal Government Relations, The B. F. Goodrich Company, 1112 - 119th St. N.W., Washington 6, D. C. Home: 4545 Connecticut Ave., Washington 8, D. C.

MARSHALL, GEORGE H., (s) Assistant Mech. Engr., Chem. & Radiological Lab., U. S. Army Chemical Center, Edgewood, Md. Home: 136 E. Gordon St., Bel Air, Md.

MARSHALL, JOHN T., (m) Chief Engr., Hamilton Division, Bendix Aviation Corporation, Hamilton, O. Home: 953 Lawn Ave., Hamilton, O.

MARSHALL, JOHN W., (m) Project Engr., Experimental Rocket Engine Test Station, AFFTC, Edwards AFB, Calif. Home: 1351 Boyd, Apt. #16, Edwards, Calif.
Edwards, Calif.

MARSHALL, OTIS W., Jr., (m) Rocket Research Engr., James Forrestal Research Center, Princeton University, Rte. 1, Princeton, N. J. Home: 225-B Marshall St., Princeton, N. J.

MARSTON, RANDOLPH B., (m) Director, Reaction Motors, Inc., Room 5600, 30 Rockefeller Plaza, New York 20, N. Y. Home: 1056 Fifth Ave., New York, N. Y.

MARTIN, CHARLES P., (m) Nuclear Group Engr., Douglas Aircraft Co., Long Beach, Calif. Home: 16100 Sunset Blvd., Pacific Palisades, Calif.

MARTIN, JAMES S., (m) Chief, Research, Structures, Weights, Republic Aviation Corp., Farmingdale, N. Y. Home: 20 Severin Pl., Huntington, N. Y.

MARTIN, LEO P., (m) Development Engr., Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 1370 N. Indian Hill Blvd., Claremont, Calif.

MARTIN, MACK L., (m) Flight Test Engr., North American Aviation, Inc., 4300 E. 5th Ave., Columbus, O. Home: 755 Stelzer Rd., Columbus, O.

MARTUCCI, ANTHONY R., (a) Designer, Engineering & Research Division, American Car & Foundry Corp., Box 209, Hyattsville, Md. Home: 4110 Gallatin St., Hyattsville, Md.

MARTINEK, JOHANN J. M., (m) Director, Research Division, Reed Research, Inc., 3269 M Street N.W., Washington, D. C. Home: 4424 Albemarle St. N.W., Washington, D. C.

MARTINI, JOSEPH C., (m) Chemist, Verona Research Center, Koppers Co., Inc., Verona, Pa. Home: 533 Paulson Ave., Pittsburgh 6, Pa.

MARVIN, ADDISON L., Jr., (s) Tufts College, Medford 55, Mass. Home: 98 Bromleigh Rd., Stewart Manor, N. Y.

MARVIN, PHILIP R., (m) Consultant, American Viscose Corporation, 1617 Pennsylvania Blvd., Philadelphia 3, Pa. Home: Old Mill Lane, Moylan-Rose Valley, Pa.

MARVIN, RICHARD H., (m) Chief Engr., Hydraulic Equipment, Watertown Div., New York Air Brake Co., Watertown, N. Y. Home: 617 Sherman St., Watertown, N. Y.

MARX, HOWARD F., (a) Head, Operations Analysis, Temco Aircraft Corp., Dallas, Tex. Home: 4708 Melita, Fort Worth, Tex.

MASCOLO, RICHARD W., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 5078 Topanga Canyon Blvd., Woodland Hills, Calif.

MASNIK, WALTER, (m) Project Engr., Walter Kidde & Co., Inc., 675 Main St., Belleville 9, N. J. Home: 139 William St., Perth Amboy, N. J.

MASON, LEMUEL M., JR., (m) Group Engr., Flight Controls, Lockheed Missile Systems Div., 7701 Woodley Ave., Van Nuys, Calif. Home: 8023 Limerick Ave., Canoga Park, Calif.

MASON, RICHARD L., (m) Staff Engr., Missiles Engng., Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 3321 Carbon Canyon Rd., Malibu, Calif.

MASTERSON, ROBERT B., JR., (m) Engng. Administrator-Coordinator, Liquid Engine Division, Aerojet-General Corp., 6352 No. Irwindale Ave., Azusa, Calif. Home: 529 So. Madison Ave., Pasadena 5, Calif.

MASTROCOLA, NICHOLAS, (m) Proj. Engr., H. A. Wagner Company, 14707 Keswick St., Van Nuys, Calif. Home: 234 West Elm St., Oxnard, Calif.

MATASOVIC, JOHN L., (a) President, Oxo Equipment Co., New Lenox, Ill. Home: Rt. 1, Mokena, Ill.

MATER, MILTON H. (a) Managing Partner, Mater Engineering Co., P. O. Box 410, Corvallis, Ore. Home: 1415 Brook Lane, Corvallis, Ore.

MATEU, PEDRO, (m) Astronomer, Institute of North-American Studies, Via Layetana 28, Barcelona, Spain. Home: Corcega 450, Barcelona, Spain

MATTHEWS, GEORGE B., (m) Res. Assist., Aeronautical Engng. Dept., Princeton University, Forrestal Research Center, Princeton, N. J. Home: 12 Park Place, Princeton, N. J.

MATTICE, HUBERT C., (m) Assistant Prof. of Aero. Engrg., Rensselaer Polytechnic Inst., Troy, N. Y. Home: 16-1 Detroit Dr., Troy, N. Y.

MATTISON, KEITH W., (m) Proj. Planning Engr., Special Defense Projects Dept., General Electric Co., 2900 Campbell Ave., Schenectady, N. Y. Home: 1001 - 6th St., Schenectady 3, N. Y.

MATTOX, CLIFF E., (m) President, Dbm Research Corporation, Stoddard Bldg., Cocoa Beach, Fla. Home: 209 Beverly Rd., Cocoa, Fla.

MAUCIERI, JOHN J., (m) Plastics Dept., Hughes Aircraft Co., Culver City, Calif. Home: 12229 Dunoon Lane, Los Angeles 49, Calif.

MAUS, HANS H., (m) Mech. Engr., ABMA, Redstone Arsenal, Huntsville, Ala. Home: 312 Panorama Dr., Huntsville, Ala.

MAXWELL, KENNETH A., (s) City College of San Francisco, Ocean & Phelan Aves., San Francisco 12, Calif. Home: 509 James St., Livermore, Calif.

MAY, ARTHUR D., (s) Home: Star Route, Nenzel, Neb.

MAY, CLAUDE H., (m) Proj. Engr., Cryogenic Pump Div., Herrick L. Johnston, Inc., 540 W. Poplar Ave., Columbus 8, O. Home: 2763 Fairfax Drive, Columbus 21, O.

MAYER, ERNEST, (m) Sr. Physicist, ARDE Associates, 14 William St., Newark 2, N. J. Home: 31-B Riverview Gardens, No. Arlington, N. J.

MAYER, F. ROBERT, (m) Advert. & Public Relations, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 26 Garret Place, Glen Rock, N. J.

MAYER, FRANK S., Jr., (m) Structures Section Supervisor, Weapons System Division, Radioplane Co., 7950 Woodley, Van Nuys, Calif. Home: 3356 Allott Ave., Van Nuys, Calif.

MAYER, WALDEMAR F., (m) Consultant. Home: 916 Monterey Road, Glendale 6, Calif.

MAYES, JAMES T., (m) Group Engr., Airplane Division, McDonnell Aircraft Corporation, Box 116, Lambert Field 21, Mo. Home: 2121 Menlo Drive, Wichita 16, Kans.

MAYES, RICHARD A., (m) District Mgr., Cook Electric Company, 401 Bassett Tower, El Paso, Tex. Home: 1500 Oakdale, El Paso, Tex.

MAZUR, DANIEL G., (m) Electronic Scientist, Naval Research Lab. A&A Div., Wash. 25, D. C. Home: 208 Modoc Lane, Wash 21, D. C.

MAZZONI, JAMES J., (m) Senior Des. Engr., Helicopter Engng. Division, McDonnell Aircraft Corp., P. O. Box 516, St. Louis 3, Mo. Home: 9029 Greenridge Dr., St. Louis 17, Mo.

MEBANE ,WILLIAM M., (m) General Mgr., Redstone Division, Thiokol Chemical Corporation, Redstone Arsenal, Huntsville, Ala. Home: 717 E. Clinton St., Huntsville, Ala.

MEEKS, PAUL J., (m) Gen. Mgr., Instrument Div., Clary Multiplier Corp., 408 Junipero, San Gabriel, Calif. Home: 2632 Boulder Rd., Altadena, Calif.

MEGHREBLIAN, ROBERT V., (m) Sr. Research Engr., Lecturer in Reactor Theory, Oak Ridge Nat'l Lab., Oak Ridge, Tenn. Home: 226 N. Purdue Ave., Oak Ridge, Tenn.

MEHEGAN, PAUL F., (a) Res. Engr., North American Aviation, Inc., 6349 E. Slauson Ave., Los Angeles, Calif. Home: 15471 Moorpark St., Apt. 5, Encino, Calif.

MEIER, JOSEPH W., (m) Design Engr., Aerojet-General Corp., Azusa, Calif. Home: 4732 North Grand Ave., Covina, Calif.

MEISEL, DAVID D., (s) Home: 800 - 8th St., Fairmont, W. Va.

MEISENHEIMER, DANIEL T., (m) Dev. Engr., Manning, Maxwell & Moore, Inc., Shelter Rock La., Danbury, Conn. Home: 50 Morris Lane, Milford, Conn.

MEISLER, JOSEPH, (a) Director Engng., Wall Cryogenics, Inc., 530 So. Wood Ave., Linden, N. J. Home: 17 Chittenden Ave., New York 33, N. Y.

MEITNER, JOHN G., (m) Head of Research, Chemistry Division, Atlantic Research Corp., 901 N. Columbus, Alexandria, Va. Home: "Highbanks," Lorton, Va.

MELDRUM, BERNARD J., (m) Staff Engr., Engng. Div., Missile Br., Chrysler Corp. P.O. Box 2628, Detroit 31, Mich. Home: 7728 E. Jefferson, Detroit, Mich.

MELOY, THOMAS PHILLIPS, (m) Specialist Water Injection, AGT Div., General Electric Co., Cincinnati 37, O. Home: 7079 Glenmeadow Lane, Cincinnati 37, O.

MELROSE, ROBERT G., (m) Gen. Mgr. Guided Missiles Div., Republic Aviation Corp., 447 Broadway, Hicksville, N. Y. Home: Lloydhaven Dr., Huntington, N. Y.

MENES, HERMAN C., (m) Chief Engr., Instrument Br., NARTS, Lake Denmark, Dover, N. J. Home: 515 Grandview Ave., Wyckoff, N. J.

MERBOTH, WARREN J., (m) Regional Rep., Sales Div., Aerojet General Corp., 6352 N. Irwindale, Azusa, Calif. Home: 137 N. Burnaby, Glendora, Calif.

MEREDITH, C. P., (m) Kelsey-Hayes Wheel Co., 3600 Military Ave., Detroit 32, Mich.

MEREDITH, GEORGE L., (m) Electronics Engr., Chief, Operations Branch, MFSO, White Sands Proving Ground, N. M. Home: 901 Raynolds Blvd., El Paso, Tex.

MERENESS, DONALD S., (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 90-29 - 70th Drive, Forest Hills 75, N. Y.

MEREWETHER, EDWARD K., (s) University of New Mexico, Albuquerque, N. M. Home: 420 Carlisle N.E., Albuquerque, N. M.

MERGEN, JOSEPH M., (m) Chief Propeller Engr., Propeller Division, Curtiss-Wright Corp., Caldwell, N. J. Home: 67 Oakridge Rd., Verona, N. J.

MERLINO, HARRY D., (s) Indiana Technical College, 221 E. Washington Blvd., Fort Wayne, Ind. Home: 1236 S. Anthony Blvd., Fort Wayne, Ind.

MERRILL, GRAYSON, (m) Capt. USN., Project Coordinator, Navy Special Project Office, U. S. Navy, Rm. 2N37, Navy Dept., Wash., D. C. Home: 4225 - 23rd St. N., Arlington 7, Va.

MERRILL, HARVEY B., Jr., (a) Sales Mgr., Radio Corp. of America, Front & Cooper, Camden, N. J. Home: 78 Valley View Terrace, Packanack Lake, N. J.

MERTZ, E. R., (m) Sr. Engr., Liquid Rocket Plant, Aerojet-General Corp., P.O. Box 1947, Sacramento, Calif. Home: 7424 Heather Rd., Fair Oaks, Calif.

MESSERLY, GEORGE H., (m) Sr. Engr., Bendix Aviation Corp., Teterboro, N. J. Home: R. D. 2, Port Murray, N. J.

MESERVEY, E. BENSON, (m) Structural Engr., Planning & Reports Sec., New England Div., Corps of Engrs., U. S. Army, 857 Commonwealth Ave., Boston, Mass. Home: 43 Park St., Wollaston 70, Mass.

MESICK, BENJAMIN S., (a) Sr. Staff Engr., Arthur D. Little, Inc., 727 W. Seventh St., Los Angeles 17, Calif. Home: 545 W. 12th St., Claremont, Calif.

MESSINGER, CARL W., Jr., (m) Project Engr., Engng. Division, Hiller Helicopters, 1350 Willow Road, Palo Alto, Calif. Home: 99 Princeton Road, Menlo Park, Calif.

METCALF, GEORGE E., (m) Associate Research Engr. A, Physical Res. Staff, Boeing Airplane Co., Seattle, Wash. Home: 501 E. 47th St., Seattle 5, Wash.

METSGER, ALFRED B., (m) Captain, U. S. Navy, Deputy and Assistant Chief of Naval Research, Office of Naval Research, Navy Department, Washington 25, D. C. Home: 3700 N. Roberts Lane, Arlington 7, Va.

METTLER, RUBEN F., (m) Director, Advanced Systems Planning, The Ramo-Wooldridge Corp., 8820 Bellanca Ave., Los Angeles 45, Calif. Home: 12263 Renfrew Road, Los Angeles 49, Calif.

METZ, THOMAS, (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 84-20 - 116th St., Richmond Hill, N. Y.

METZ, WALTER C., (s) Jr. Expeditor, Triangle Publications, Inc., 400 N. Broad St., Phila. 41, Pa. Home: 917 Fisher Ave., Phila. 41, Pa.

MEYER, MARVIN, (m) Supervising Proj. Engr., Propeller Div., Curtiss-Wright Corp., Caldwell, N. J. Home: 120 Forest Ave., W. Caldwell, N. J.

MEYER, ROY E., (a) Home: 2053 Tapia Blvd. S.W., Albuquerque, N. M.

MEYERS, DONALD L., (a) Chief Engr., Rock Island Arsenal, Rock Island, Ill. Home: 48 Hawthorne Rd., Rock Island, Ill.

MEYERS, GEORGE M., (a) Executive Vice-President, Reading Tube Corp., So. 7th & South Sts., Reading, Pa. Home: 214 Wyomissing Blvd., Wyomissing, Pa.

MEYN, FREDERICK W., (a) Supervisor, Product Design, Light Military Electronics Equip. Dept., General Electric Co., French Road, Utica, N. Y. Home: 11 Lower Woods Rd., Utica, N. Y.

MHOON, S. McKEE, (m) Western Airmotive Company, 1st Western Bank Bldg., Oakland 12, Calif. Home: 31 Glen Alpine, Piedmont 11, Calif.

MIALE, CHARLES V., (s) Aerodynamicist, Aerodynamics Group, Kaman Aircraft Corp., Bloomfield, Conn. Home: R.F.D. #1, Hebron Ave., Glastonbury, Conn.

MICHAEL, DONALD T., (m) Electrical Engr., Cincinnati Gas & Elec. Co., Box 960, Cincinnati 1, O. Home: 3917 Millsbrae, Cincinnati 9, O.

MICHAELS, FRANK H., (a) Washington University, St. Louis, Mo. Home: 409 Crest, Kirkwood 22, Mo.

MICHAELS, HENRY B., Jr., (m) Exec. Vice-Pres. & Asst. Gen. Mgr., Reaction Motors, Inc., Denville, N. J. Home: 71 Crane Rd., Mt. Lakes, N. J.

MICHAELS, WALTER C., (m) Missile Test Engr., Convair, A Division of General Dynamics Corp., Pomona, Calif. Home: 20107 E. Puente St., Covina, Calif.

MICHEL, LEOPOLD R., (m) Manager, Project Objectives & Advance Engng., Small Aircraft Engine Department, General Electric Co., 1000 Western Ave., Lynn, Mass. Home: 4 Peach Highlands, Marblehead, Mass.

MICHELE, WILLIAM C., (s) Home: 600 Lake Ave., Grand Haven, Mich.

MICHELSON, IRVING, (m) President, Odin Associates, P. O. Box 4242, Catalina Sta., Pasadena, Calif. Home: 281 E. Claremont St., Pasadena, Calif.

MICHELSON, LOUIS, (m) Manager, Rocket Engine Section, Aircraft Gas Turbine Div., Development Dept., General Electric Co., Jimson Road, Cincinnati 15, O. Home: 3679 Langhorst Ct., Cincinnati 36, O.

MICHIELSEN, HERMAN F., (m) Structures Engr., Structures Dept., Lockheed Aircraft Corp., Burbank, Calif. Home: 11101 Whitegate Ave., Sunland, Calif.

MIDDLEWOOD, ROBERT W., (m) Chief Engr., Lockheed Aircraft Corp., Marietta, Ga.

MIELE, ANGELO, (m) Associate Professor, Dept. of Aeronautical Engineering, Purdue University, Lafayette, Ind.

MIESSE, C. CHARLES, (m) Physicist, Study & Applied Res. Dept., Aerojet-General Corporation, Azusa, Calif. Home: 303 North Mayflower Ave., Monrovia, Calif.

MIHM, EDWARD, (m) Eng. Dftsm., Tech. Analysis Div., Holloman Air Development Cen., ARDC, Holloman A.F.B., N. M. Home: 1300 Catalina La., Alamogordo, N. M.

MILAM, WILLIAM T., (m) President, Braniff Engineering Co., Box 3827 Oklahoma City 6, Okla. Home: 821 N.W. 39th, Oklahoma City 18, Okla.

MILES, GEORGE E., (m) Rocket Design Engr., Rocket Fuels Div., Phillips Petroleum Co., McGregor, Tex. Home: 3828 Huaco Lane, Waco, Tex.

MILESON, DONALD F., (m) Major, USMC, U. S. Marine Corps, H&HS, 3rd MAW, MCAS, El Toro, Calif. Home: 112 Chenery St., Portland, Me.

MILL, ROBERT J., (m) Chief, Armament Dept., Aerojet-Genl. Corp., Azusa, Calif. Home: 1165 Pine Bluff Dr., Pasadena 8, Calif.

MILLAN, RAUL, (s) City College of New York, New York, N. Y. Home: 177 East 109th St., New York 29, N. Y.

MILLAR, JOHN H., (m) Gen. Mgr., Avica Corp., Newport, R. I. Home: Winter Cottage, Harrison Ave., Newport, R. I.

MILLEA, LEO, Jr., (s) State Teachers College, Fitchburg, Mass. Home: 459 Broadway, Somerville 44, Mass.

MILLER, BRIAN S., (s) University of Arkansas, Fayetteville, Ark. Home: 668 Gray St., Fayetteville, Ark.

MILLER, ERNEST J., (m) Coordinator-Defense Contracts, B. F. Goodrich Chemical Co., 2060 E. Ninth St., Cleveland 15, O. Home: 1378 Croyden Rd., Lyndhurst, O.

MILLER, FRANKLIN E., (s) Purdue University, Box 596, Cary Hall, Lafayette, Ind. Home: 5655 Harper, Chicago 37, Ill.

MILLER, GERALD N., (m) Associate Engr., Instrumentation Dept., Glenn L. Martin Co., Baltimore 3, Md. Home: 3707 Springdale Ave., Baltimore 16, Md.

MILLER, GUSTAVUS S., Jr., (m) Devel. Engr., Rocket Engine Dept., Aerojet-General Corp., Sacramento, Calif. Home: 5425 Carmelo Way, Sacramento 22, Calif.

MILLER, HOWARD L., (m) Metallurgical Engr., High Strength Steel Division, Republic Steel Corp., 910 Republic Bldg., Cleveland 1, O. Home: 2648 Ashton Road, Cleveland Heights 18, O.

MILLER, JAMES E., (a) Optometrist, P.O. Box 296, Exeter, Calif.

MILLER, JAMES H., (m) Engr. Specialist, Aerophysics Dept., Goodyear Aircraft Corp., Akron 15, O. Home: 606 Sunset Blvd., North Canton, O.

MILLER, JULIAN H., II, (m) Publisher, Prom Magazine, 706 Chestnut, St. Louis 1, Mo.

MILLER, K. DEXTER, Jr., (m) Division Engr., Defense Products Engng. Dept., The M. W. Kellogg Co., P. O. Box 469, Jersey City 3, N. J. Home: Province Line Road, Princeton, N. J.

MILLER, LEWIS D., (m) Senior Investigator, Physicist, Nucleonics, U.S.N. Radiological Defense Laboratory, S. F. Naval Shipyard, San Francisco 24, Calif. Home: 2622 Clement St., San Francisco 21, Calif.

MILLER, LOWELL, (m) Senior Research Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 20301 Roscoe Blvd., Canoga Park, Calif.

MILLER, RAY A., (s) Field Service Engr., Douglas Aircraft Co., Santa Monica, Calif. Home: Box 325, Carrizozo, N. M.

MILLER, RICHARD J., (m) Stress Engr., Structures Dept., Beech Aircraft Corp., Central Ave., Wichita 1, Kans. Home: 1201 N. Harding, Wichita 14, Kans.

MILLER, RILEY O., (m) Aero. Research Scientist, NACA, Brookpark Rd., Cleveland, O. Home: 1259 Cranford Ave., Lakewood 7, O.

MILLER, WILLIAM A., (m) Engine Layout, Engng. Div., Chrysler Corp., 12800 Oakland Ave., Highland Park, Mich. Home: 22477-15 Mile Rd., Mt. Clemens, Rte. 5, Mich.

MILLS, CLARENCE H., (m) Major, Director of Safety, USAF, Hq. Sq. Sec. 3520th Combat Crew Tng. Wing., McConnell AFB, Wichita, Kan.

MILLS, HUGH A., (m) Mech. Engr., The A. H. Emery Co., Pine St., New Canaan, Conn.

MILLS, JAMES L., (s) University of Minn., Minneapolis, Minn. Home: 825 4th Ave., So. Minneapolis, Minn.

MILLS, MARK M., (m) Head, Theoretical Division, Univ. of Calif. Rad. Lab., P. O. Box 808, Livermore, Calif. Home: 4 Holiday Dr., Danville, Calif.

MILLS, WALTER B., (m) Res. Engr., Pilotless Aircraft Division, Boeing Airplane Co., 7755 E. Marginal Way, Seattle 14, Wash. Home: 1503 N. 107th, Seattle 33, Wash.

MINER, JOHN D., JR., (m) Engng. Mgr., Design Engng., Aircraft Equipment Dept., Westinghouse Electric Corp., Lima, O. Home: 316 So. Rosedale Ave., Lima, O.

MINICHIELLO, RAYMOND, (m) Radio Com. Sales, General Electric Co., Wellesley, Mass.

MINOR, HOWARD C., (m) Engr., Goodyear Aircraft Corp., 1210 Massillon Rd., Akron, O. Home: P. O. Box 26, Oscoda, Mich.

MINNICK, RICHARD E., (m) Development Engr., Explosive Ordnance Dept., Aerojet-General Corp., Azusa, Calif. Home: 130 W. Hillcrest, Monrovia, Calif.

MINTER, JAMES M., (m) Captain, United States Army, Support Ballistic Missile Agency, Redstone Arsenal, Huntsville, Ala. Home: 1005 Ballard Dr., Huntsville, Ala.

MISENHIMER, JAMES T., (m) Design Engr "A", Engng. Development & Test Dept., Missile Systems Div., Lockheed Aircraft Co., 7701 Woodley Ave., Van Nuys, Calif. Home: 539 Fermoore St., San Fernando, Calif.

MITCHELL, NORMAN W., (m) Home: 228 Jasmine, Corona Del Mar, Calif.

MITCHELL, RICHARD S., (m) Vice President, Guided Missiles Range Division, Pan American World Airways, Inc., P. O. Box 308, Patrick Air Force Base, Fla. Home: P. O. Box 63, Cocoa Beach, Fla.

MITCHELL, WILLIAM P., (a) Supt. Range Services, Pan American World Airways, Inc., P.O. Box 308, Patrick Air Force Base, Fla. Home: P.O. Box 571, Cocoa Beach, Fla.

MITTELHAMMER, JR., (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 22 Edward St., Bergenfield, N. J.

MITTON, ROBERT L., (a) Test & Development Engr., Test & Development Dept., Kaman Aircraft Corp., Windsor Rd., Bloomfield, Conn. Home: Glen Rd., Granby, Conn.

MIZEN, WALTER J., (m) Project Engr., Hamilton Division, Bendix Aviation Corp., Hamilton, O. Home: 798 Mark Ave., Hamilton, O.

MOCK, F. C., (m) Director, Fuels Systems Engr., Missiles Div., Bendix Aviation Corp., Mishawaka, Ind. Home: 400 S. Beiger St., Mishawaka, Ind.

MOCK, WESLEY C., JR., (m) Chief Engr. & Works Manager, Fada Radio & Electric Co., Inc., 525 Main St., Belleville 9, N. J. Home: 11 Valhalla Way, Preakness, Paterson 2, N. J.

MODIG, GERALD R., (s) Chemist, Product Development, Reinforced Plastics Division, Minnesota Mining & Mfg. Co., 900 Fauquier Ave., St. Paul 16, Minn. Home: 1751 Frost Ave., St. Paul 17, Minn.

MODIGLIANI, PIERO, (a) Pres. & Tech. Director, Modigliani Glass Fibers, Inc., 815 Lawrence St., Lancaster, O. Home: 45 Papermill Rd., Manhasset, L. I., N. Y.

MOEBIUS, CHARLES M., (m) Staff Engr., Parker Aircraft, 5827 W. Century Blvd., Long Beach, Calif. Home: 2119 Stevely Ave., Long Beach, Calif.

MOEN, WALTER B., (m) Section Head, Research Laboratory, Air Reduction Co., Inc., Murray Hill, N. J. Home: 86 Delmore Ave., Berkeley Heights, N. J.

MOFFETT, CHRISTOPHER O., (m) Colonel, USAF, 3520 Maintenance & Supply Grp., McConnell AFB, Wichita, Kan. Home: 622 Fabrique, Wichita, Kan.

MOFFITT, JOHN V., (m) Project Engr., Engines, Fuels & Lubricants Dept., Southwest Research Institute, 8500 Culebra Rd., San Antonio 6, Tex. Home: Route 11, Box 708, San Antonio 1, Tex.

MOLDENHAUSER, JAMES G., (s) Physicist, Rocket Development Dept., Naval Ordnance Test Station, China Lake, Calif. Home: Box 213, China Lake, Calif.

MOLDT, VERNE G., (a) Sales Engr., Panelyte Div., St. Regis Sales Corp., 3431 N. Knox Ave., Chicago 41, Ill. Home: 7910 Karlov Ave., Skokie, Ill.

MOLLEK, JOSEPH W., (m) Vice President, Manager, Special Products Div., Kidde Precision Tool Corporation, Locust Ave., Roseland, N. J. Home: 6 Woodland Ave., Mountain Lakes, N. J.

MONDROSCH, JOHN A., (a) Customer Engr., International Business Mach. Co., 230 So. 15th St., Philadelphia, Pa. Home: 2434 E. Clearfield St., Philadelphia 34, Pa.
MONGIAT, ROBERT, (m) Design Engr., Pratt & Whitney Aircraft, 400 Main St., East Hartford, Conn. Home: Mobilehome Village, East Hampton, Conn.
MONSON, DONALD LEE, (s) Home: 6829—23rd Ave., Kenosha, Wis.
MONSON, FRANKLIN A., (m) Sr. Layout Engr., Aircraft Armaments, Inc., Baltimore, Md. Home: Box 42, Long Green Rd., Glen Arm, Md.
MONTEATH, EDWARD B., (m) Assist. Project Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 3616 Thorndale Rd., Pasadena 10, Calif.
MONTS, L. FRANK (m) Staff Engr.-Propulsion, Engng. Dept., Beech Aircraft Corporation, 9709 East Central, Wichita 1, Kan. Home: 6519 Marjorie Lane, Wichita, Kan.
MONTUSI, ROBERT R., (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 2958 Avenue R., Brooklyn 29, N. Y.
MOON, ALBERT I., (m) Stress Analyst "A", Structures, Aerophysics Development Corp., 1452 4th St., Santa Monica, Calif. Home: 840-C Pearl St., Santa Monica, Calif.
MOORE, BEAL, P., (m) Guided Missile Div., Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles, Calif.
MOORE, F. DONALD, (m) Chief, Range Facilities Control Office, Integrated Range Mission, White Sands Proving Ground, N. M. Home: 525 Linda Vista, Las Cruces, N. M.
MOORE, FRED W., (s) University of Michigan, 212 Whinchell West Quad., Ann Arbor, Mich. Home: 908 Fraser St., Bay City, Mich.
MOORE, GEORGE E., (m) Research Associate, General Electric Co., The Knolls, Schenectady 5, N. Y. Home: 425 Charles St., Scotia 2, N. Y.
MOORE, L. SILAS, JR., (s) Guided Missile Development Division, Redstone Arsenal, Huntsville, Ala. Home: 1525 Shoup Court, Decatur, Ga.
MOORE, NORTON B., (m) Aerophysics Specialist, Aerophysics Development Corp., Santa Monica, Calif. Home: 3627 Lemon Str., Riverside, Calif.
MOORE, ROBERT E., (s) Draftsman, Central Development Dept., General Tire & Rubber Co., Englewood Ave., Akron 9, O. Home: 1127 Stanwood Ave., Akron 14, O.
MOORE, R. GILBERT, (m) Associate Engr., Physical Science Laboratory, New Mexico College of A. & M. A., Box 548, State College, N. M. Home: Box 442, State College, N. M.
MOORE, ROBERT L., (m) Supervisor, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 15043¼ Dickens, Sherman Oaks, Calif.
MOORE, WENDELL F., (m) Rocket Installations Engr., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: P. O. Box 414, Youngstown, N. Y.
MOOTSCHNIK, DAVID L., (s) Brooklyn Polytechnic Institute, 99 Livingston St., Brooklyn, N. Y. Home: 533 East 2nd St., Brooklyn 18, N. Y.
MORALES, GONZALO J., (m) Venezuelan Bureau of Special Studies, Caracas, Venezuela. Home: 22 Radmoor Rd., Loughborough, Leics, England.
MORENO, MARCELO, (a) Construcciones Belgo Mexicanas, SA., Calle Trigo No. 30, Ixtapalapa, 13, D. F. Home: Calzada Detlalpam 1630, Mexico 13, D. F.
MORGAN, A. HENRY, (m) General Mgr., Gorn Electric Co., Inc., 845 Main St., Stamford, Conn. Home: Forbell Dr., Stamford, Conn.
MORGAN, G. RICHARD, (m) Res. Engr., Turbo Engng. Dept., American Machine & Foundry, Pacoima, Calif. Home: 7752 Lindley Ave., Reseda, Calif.
MORIN, DONALD G., (s) Polytechnic Inst. of Brooklyn, Brooklyn, N. Y. Home: 156 Dean St., Brooklyn 17, N. Y.
MORIN, R. R., (m) Proj. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 23038 Ostronic Dr., Woodland Hills, Calif.
MORIN, WILFRED W., Clark University, 950 Main St., Worcester, Mass. Home: Pollard Rd., Millbury, Mass.
MORELL, GERALD, (m) Hd. Rocket Combustion Sect., NACA, Lewis Flight Prop. Lab., 21000 Brookpark Rd., Cleveland 11, O. Home: 25715 Cook Rd., Olmsted Falls, O.
MORRIS, BROOKS T., (m) Executive Engr., Powerplants, Engng. Div., Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 924 No. Chester Ave., Pasadena 6, Calif.
MORRIS, DEANE N., (m) Design Specialist, Aerodynamics, Douglas Aircraft Co., El Segundo, Calif. Home: 535 Erskine Dr., Pacific Palisades, Calif.
MORRIS, JOHN K., (m) Manager of Engng., Western Gear Corp., Box 182, Lynwood, Calif. Home: 12228 S. Rives, Downey, Calif.
MORRISON, DONALD C., (m) Research Chemist, Univ. of Calif., Berkeley, Calif. Home: 129 Tamalpais Rd., Berkeley, Calif.
MORRISON, DONALD E., (m) Chief Combustion Engineer, Orenda Engines Limited, Box 4015 Terminal A, Toronto, Ontario.
MORRISON, HERBERT E., (m) Electronics Standards Engr., Engng. Div., Glenn L. Martin Company, Baltimore 3, Md. Home: P. O. Box 7711, Baltimore 21, Md.
MORRISON, RICHARD B., (m) Assist. Prof. Aero. Engng. & Supervisor, Aircraft Prop. Lab., University of Michigan, Ann Arbor, Mich. Home: 1954 Midvale, Ypsilanti, Mich.
MORSE, CHARLES, (s) Parks College, E. St. Louis, Ill. Home: 729 Columbus St., Grand Haven, Mich.
MOSELEY, CORLISS C., (m) Pres. & Ch. of Board, Grand Central Rocket Co., 1310 Airway, Glendale, Calif. Home: Beverly Hills, Calif.
MOSELEY, TOMLINISON I., (m) President, Dalmo Victor Co., 1414 El Camino Real, San Carlos, Calif. Home: 297 Park Lane, Atherton, Calif.
MOSKOVICS, FREDERICK E., (m) Industrial Consultant, A. O. Smith Corporation, 250 Park Ave., New York 17, N. Y. Home: 2 Indian Dr., Old Greenwich, Conn.
MOSLEY, ZACK T., (m) Aviation Cartoonist, Chicago Trib-N. Y. News Synd., 220 E. 42nd St., N. Y. 17, N. Y. Home: P. O. Bin 14, Stuart, Fla.
MOSS, DAVID E., (s) Purdue University, W. Lafayette, Ind. Home: 1822 S. Union St., Kokomo, Ind.
MOSS, JOHN B., (m) Pres., Hoffman Laboratories, Inc., 3761 S. Hill St., Los Angeles, Calif. Home: 11524 Bellagio Rd., Los Angeles 49, Calif.
MOUNT, WADSWORTH W., (m) Consultant, 51 High St., Summit, N. J. Home: Club Road, Chatham, N. J.
MOWER, WILLIAM W., (m) Group Leader, Combustion Devices Group, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 20500 Kittridge Ave., Canoga Park, Calif.
MOWERS, BOB, (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 1030 West 78th St., Los Angeles, Calif.
MOZER, CHARLES F., (s) Lab. Asst., Physical Science Lab., State College, N. M., Box 548, State College, N. M. Home: Box 662, State College, N. M.
MRAZ, CHARLES L., (s) Stanford Univ., Stanford, Calif. Home: 2939 Marconi Ave., Apt. 10, Sacramento 21, Calif.
MRAZEK, WILLIAM A., (m) Guided Missile Design Engr., ABMA, Structures & Mechanics Laboratory, Redstone Arsenal, Huntsville, Ala. Home: 910 Union Dr., Huntsville, Ala.
MUCH, RICHARD C., (m) Development Engr., Liquid Engine Division, Aerojet-General Corporation, 6352 N. Irwindale Ave., Azusa, Calif. Home: 735 E. Meda Ave., Glendora, Calif.
MUELLER, DONALD, Aircraft Gas Turbine Div., Dev. Dept., General Electric Co., Bldg. 304, Evendale, O. Home: 938 Briarton Dr., Crestwood 19, Mo.
MUELLER, HEINZ, (m) Group Leader Rocket Engine Design, Rocket Dept., Bell Aircraft Corp., Box 1, Buffalo 5, N. Y. Home: 738 S. Transit Rd., Lockport 21, N. Y.
MUELLER, KURT H., (m) Sr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 5244 Van Alden Ave., Tarzana, Calif.
MUHRLEIN, HAROLD A., JR., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 18745 Old Homestead, Detroit 36, Mich.
MULGRAVE, THOMAS P., (m) Supervisory Aero. Research, Naval Aircraft Factory, NAMC, Phila. Naval Base Sta., Philadelphia, Pa. Home: 4120 Vernon Rd., Drexel Hill, Pa.
MULL, IRVIN W., (m) Chemist, Elkton Div., Thiokol Chem. Corp., Elkton, Md. Home: 106 W. 36th St., Reiffton, Reading, Pa.
MULLEN, DONALD E., (m) Sales Engr., Special Defense Proj. Dept., General Electric Co., 2900 Campbell Ave., Schenectady, N. Y. Home: 886 Stark Ave., Schenectady, N. Y.
MULLEN, JAMES W. II, (f) President and Techinal Director, Experiment Incorporated, P. O. Box 1-T, Richmond 2, Va.
MULLER, LOUIS F., (m) Senior Design Engr., Engng. Dept., Convair, A Division of General Dynamics Corp., Pacific Highway, San Diego, Calif. Home: 1935 Felspar St., San Diego 9, Calif.
MULLIGAN, WILLIAM R., (m) Assist. Senior Engr., Explosive Ordnance—Armament, Aerojet-General Corp., Azusa, Calif. Home: 1753 Oakwood Ave., Arcadia, Calif.
MULLIKEN, STUART R., (m) Home: 16709 Kalisher St., Granada Hills, Calif.
MULTER, MARTIN H., (s) New York University, New York, N. Y. Home: 1721 E. 31st St., B'kyn 34, N. Y.
MUNCH, NEIL E., (m) Chief Project Engr., Power Generators, Inc., 109 State St., Albany, N. Y. Home: 5-B Old Hickory Dr., Albany 4, N. Y.
MUNDEN, ROBERT A., (a) Foreman, Experimental Missile Systems, Experimental Rocket Engine Test Sta., U. S. Air Force, Edwards AFB, Edwards, Calif. Home: 332 E. Kildare, Lancaster, Calif.
MUNDT, KENNETH F., (m) Director of Manufacturing, Aerojet-General Corporation, P. O. Box 296, Azusa, Calif. Home: 4081 Hempstead Rd., La Canada, Calif.
MUNGER, WILLIAM P., (m) Mgr. of Engng. & Res. Div., Reaction Motors, Inc., Denville, N. J. Home: R.D. #1 Pleasant Valley Rd., Far Hills, N. J.
MUNNELL, EDWARD T., (m) Project Engr., Glenn L. Martin Co., Baltimore 3, Md. Home: 3015 Oakcrest Ave., Baltimore 14, Md.
MUNROE, CHARLES C. III, (s) Home: 25741 Kennedy, Dearborn Twp., Mich.

MUNSEY, EDWARD H., (m) Supervisor, Missile Test Facility, Industrial Engng., Northrop Aircraft, Inc., Hawthorne, Calif. Home: P. O. Box 402, Cocoa Beach, Fla.

MUNYON, WAYNE H., (s) Purdue University, W. Lafayette, Ind. Home: 323 State St., W. Lafayette, Ind.

MURPHY, ALBERT L., (m) Reg'd Prof. Engr., P. O. Box 1352, Trona, Calif.

MURPHY, EDWARD D., Flight Test Engr., Power Plant, Flight Test Dept., Boeing Airplane Co., East Marginal Way, Seattle, Wash. Home: 432 Loop Dr., Moses Lake, Wash.

MURPHY, JOHN J., (m) Director of Patent Affairs, Patent Dept., Union Carbide & Carbon Corp., 30 E. 42nd St., Room 502, N. Y. 17, N. Y.

MURPHY, RICHARD P., (s) Univ. of Buffalo, Main St., Buffalo 15, N. Y. Home: 260 Deerfield, Buffalo 15, N. Y.

MURPHY, THOMAS V., (m) Mechanical Engr., Egli & Gompf Inc., 1019 N. Calvert St., Baltimore, Md. Home: 300 Kingston Rd., Baltimore 29, Md.

MURPHY, WALTER J., (a) Director of Industrial Relations, Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 2048 N. Sinaloa, Altadena, Calif.

MURRAY, WILSON A., (m) Design Engr., Aerojet-General Corp., Azusa, Calif. Home: 1972 Primrose Ave., So. Pasadena, Calif.

MURRAY, YVONNE E., (a) Product Design, Chrysler Missile Operations, P. O. Box 2628, Detroit 31, Michigan. Home: 14195 Dale, Detroit 23, Mich.

MURTY, KENNETH T., (m) Prop. Engr., Chance Vought Aircraft, Inc., Dallas, Tex. Home: 400 Parkview, Arlington, Tex.

MUSIAL, W. P., (a) Service Analyst, Field Service, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 11152 Wagner, Culver City, Calif.

MUSSELL, DONALD E., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 19218 Victory Blvd., Reseda, Calif.

MYATT, DeWITT O., (m) Manager of Development, Atlantic Research Corporation, 901 North Columbus S., Alexandria, Va. Home: 1 Bolling Rd., Tanxmont, Alexandria, Va.

MYCROFT, GEORGE H., (s) National Service, Royal Signals, British Army. Home: School House, Benefield, Peterborough, England.

MYERS, DANIEL B., (m) Project Engr., Redstone Division, Thiokol Chemical Corp., Huntsville, Ala. Home: 717 Dale Dr., Huntsville, Ala.

MYERS, HARRY S., JR., (m) Assist. Head, Thrust Chamber Dept., Liquid Engine Div., Aerojet-General Corp., Azusa, Calif. Home: Apt. 14-A, 245 W. Colorado Blvd., Arcadia, Calif.

MYERS, JOSEPH A., (a) Senior Propulsion Mechanic, Santa Susana Facility, North American Aviation, Inc., Santa Susana, Calif. Home: 5053 Serrania Ave., Woodland Hills, Calif.

MYERS, SAMUEL A., (m) Res. Analyst, Flight Controls Dept., Northrop Aircraft, Inc., Northrop Field, Hawthorne, Calif. Home: 307 N. Midway Ave., Whittier, Calif.

MYERS, THOMAS E., (m) Assist. Propulsion Test Mgr., North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 8956 Rathburn, Northridge, Calif.

MYERS, WILLARD D., (m) Regional Sales Engr., Gov't.-Industrial Div., Philco Corporation, 666 Lake Shore Dr., Chicago 11, Ill. Home: 850 DeWitt Place, Chicago 11, Ill.

MYERS, WILLIAM A., (s) University of Arkansas, Fayetteville, Ark. Home: 537 Leverett Ave., Fayetteville, Ark.

MYSLAK, THADDEUS B., (s) Flight Research Engr., Sikorsky Aircraft Corp., South Ave., Bridgeport, Conn. Home: 38 Gold St., New Britain, Conn.

N

NAAB, KENNETH N., (m) Aero-dynamicist, North American Aviation, Inc., 4300 E. 5th Ave., Columbus, O. Home: 231 Apt. C, Mayfair Blvd., Columbus, O.

NADEL, ISIDORE G., (m) Chem. Engr., Research & Devel., Picatinny Arsenal, Dover, N. J. Home: 55-D Bruan Place, Clifton, N. J.

NAEGELE, ROBERT J. II, (m) Staff Engr., Missile Systems Division, Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 6465 Hayvenhurst Ave., Van Nuys, Calif.

NAGLE, DUANE W., (a) M. D., Enderlin, No. Dak.

NAGIN, IRA, (m) Development Engr., Test Division, Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 1005 San Ramon Way, Sacramento, Calif.

NAISH, JOHN V., (m) Executive Vice President, Convair, A Division of General Dynamics Corp., 3165 Pacific Highway, San Diego 12, Calif. Home: 1361 Rhoda Dr., La Jolla, Calif.

NAKAGAWA, RYOICHI, (m) Director and Mgr., Engng., Fuji Precision Machinery Co., Ltd., 88 Shumanchi Suginamiku, Tokyo, Japan. Home: 235 Ichome Amanuma Suginamiku, Tokyo, Japan.

NANCE, JULIAN, (a) McDonnell Aircraft Corp., Robertson, Mo. Home: 1316 North & South Rd., St. Louis, Mo.

NAROG, JOHN, JR., (m) Test Coordinator, Bell Aircraft Corp., P. O. Box 1, Buffalo, N. Y. Home: 538 North Ave., N. Tonawanda, N. Y.

NATHE, ROBERT U., (m) Supervisor, Electronic Systems Section, Guided Missile Division, Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles 54, Calif. Home: 5747 Cedar Ave., Long Beach 5, Calif.

NAUGLE, GERALD R., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 2573 Bonbright St., Flint, Mich.

NAYLOR, THURMAN F., (m) Mgr., Contracting Dept., Metal Products Div., Koppers Co., Inc., 200 Scott St., Baltimore 3, Md. Home: 5918 Bertram Ave., Baltimore 14, Md.

NEALE, E. K., (m) V. P. Engng., Leach Corporation, 5915 Avalon Blvd., Los Angeles 3, Calif.

NEISS, EDWARD S., (s) Newark College of Engineering, Newark, N. J. Home: 73 Willoughby St., Newark 8, N. J.

NELSON, JOHN R., (a) Program Eng., ANP Dept., General Electric Co., Bldg. D., Evendale, O. Home: 975—52nd St., Brooklyn 19, N. Y.

NELSON, LOUIS D., (m) Des. Engr., Power Plt. Prelim. Des., Beech Aircraft Corp., Wichita, Kan. Home: 3126 Stafford, Wichita, Kan.

NELSON, WARREN A., Design Draftsman, Consultant & Designers, 650 11th Ave., N. Y. Home: 68 Franklin Ave., Sea Cliff, N. Y.

NELSON, WILLARD L., (a) Res. Tech., Antenna Lab., Radioplane Corp., 8000 Woodley, Van Nuys, Calif. Home: 18046 Erwin, Reseda, Calif.

NEMICK, STANLEY J., (m) Product Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 56 Cypress St., Newark, N. J.

NESMITH, JAMES II, (m) Colonel, U. S. Army Reserve, 1394 USAR Guided Missiles Bn., 529 W. 42nd St., New York 36, N. Y. Home: 107 Tenth St., Garden City, N. Y.

NESSEN, JOHN W., (a) Assist. Supervisor, Publications, Service Department, Kaman Aircraft Corporation, Bloomfield, Conn. Home: Pleasant Valley, Conn.

NEU, EDWARD A., JR., (m) Sr. Engr., Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 2714 Walnut Ave., Carmichael, Calif.

NEUDECK, GENE T., (m) Assist. Sales Mgr., Perfex Corporation, 500 W. Oklahoma Ave., Milwaukee 7, Wis. Home: 1118 Fletcher Ave., Kalamazoo, Mich.

NEUFFER, BRUCE H., (m) Supervisor-Preliminary Design Unit, Rocket Section, Aircraft Gas Turbine Div., General Electric Co., Evendale, O. Home: 8686 Elmtree Ave., Cincinnati, O.

NEUHOEFER, KURT K., (m) Engr., Republic Aviation Corp., 99 Church St., New York, N. Y. Home: 84 Demarest Pl., Maywood, N. J.

NEUMANN, RICHARD D., (s) Parks Air College, E. St. Louis, Ill. Home: 1107 Danforth St., Alton, Ill.

NEUMANN, RICHARD K., (m) Mathematician, Aerojet-General Corp., Sacramento, Calif. Home: 2824 El Camino Ave., Sacramento, Calif.

NEVILLE, LESLIE E., (m) Director of Public Relations and Advertising, American Bosch Arma Corporation, Roosevelt Field, Garden City, N. Y. Home: 1261 Princeton Rd., West Englewood, N. J.

NEVITT, CHARLES E., (m) Training Supervisor, Personnel Department, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 7149 Glenn Hills Road, Ft. Worth, Tex.

NEWBURN, FLOYD A., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 22733 MacFarlane Dr., Woodland Hills, Calif.

NEWBY, DAVID H., (m) Chief, Test & Evaluation Branch, Rocket Development Laboratories, Redstone Arsenal, Huntsville, Ala. Home: 1411 California St., Huntsville, Ala.

NEWELL, HOMER E., JR., (m) Superintendent, Atmosphere and Astrophysics Division, Naval Research Laboratory, 4555 Overlook Dr., Washington 25, D. C. Home: 4401 Westbrook Lane, Kensington, Md.

NEWHALL, CHARLES W., JR., (m) President and Treasurer, Flight Refueling, Incorporated, Friendship International Airport, P. O. Box 1701, Baltimore 3, Md. Home: 1104 Malvern Ave., Towson 4, Md.

NEWHART, DUANE, (m) Home: 2619 Fifth Ave., Seattle 1, Wash.

NEWMAN, A. J., (m) Vice Pres. & Gen. Mgr., Excelco Developments, Inc., Mill St., Silver Creek, N. Y. Home: 102 Iola Dr., Irving, N. Y.

NEWMAN, ROBERT S., (m) Sr. Engr., Solid Engine Department, Aerojet-General, Box 1168, Sacramento, Calif. Home: 1900 Ladino Rd., Sacramento, Calif.

NEWTON, JOHANNES S., (m) President, Professional Consultants, 35 So. Raymond Ave., Pasadena 1, Calif. Home: 10358 Riverside Dr., North Hollywood, Calif.

NICASTRO, LAWRENCE N., (m) Ordnance Proj. Engr., Redstone Arsenal, Huntsville, Ala. Home: 709 College Hill Apts., Huntsville, Ala.

NICHOLLS, JAMES A., (m) Instructor, Dept. of Aero. Engng., Univ. of Michigan, Ann Arbor, Mich. Home: 19960 Avon, Detroit 19, Mich.

NICHOLS, JOHN F., (m) Head, Architect Engr. Services Dept., Facilities Division, Aerojet-General Corp., Azusa, Calif. Home: 627 Santa Rosa, Arcadia, Calif.

NICHOLSON, KENNETH C., (m) Supervising Engr., Research & Dev. Div., The Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Home: 2440 Niagara Ave., Niagara Flls, N. Y.

NICKERSON, J. C., (m) Col., Army Ballistic Missile Agency, Redstone Arsenal, Huntsville, Ala. Home: Qtrs. 811, Redstone Arsenal, Ala.

NICOLAY, PHILLIP E., (a) Sr. Test Engr., Group 64, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: Star Route, Boron, Calif.

NICOLAYSEN, EMIL, (s) Res. Assist., Michigan Memorial Phoenix Project, University of Michigan, Ann Arbor, Mich. Home: 830 S. First St., Ann Arbor, Mich.

NICOLOSI, SEBASTIAN J., (m) Assoc. Director, Chicago Midway Laboratories, Univ. of Chicago, 6040 S. Greenwood, Chicago 37, Ill. Home: 193 Washington St., Park Forest, Ill.

NIEDERMAN, HOWARD H., (m) Sr. Chem., Aerojet-General Corp., Azusa, Calif. Home: 3870 Greenhill Rd., Pasadena, Calif.

NIELSEN, EDWIN A., (m) Staff Engr., Missile Operations, Chrysler Corp., Box 2628, Detroit 29, Mich. Home: 4328 Orchard Hill Dr., Birmingham, Mich.

NIELSEN, JULIAN J., (m) Engr. JPL., Calif. Institute of Technology, 4800 Oak Grove Dr., Pasadena, Calif. Home: 11239 Miloann St., Arcadia, Calif.

NIELSEN, PAUL R., (m) Mech. Engng., Thiokol Chemical Corp., Huntsville, Ala. Home: 147 Redstone Park, Huntsville, Ala.

NICOLAIDES, NICOLAS, (s) New York University, New York, N. Y. Home: 521 E. 149th St., New York 55, N. Y.

NIERENBERG, BYRON, (m) Assistant to Vice President, Aviation Sales, The New York Air Brake Co., 230 Park Ave., New York 17, N. Y. Home: 81 Jarvis Pl., Lynbrook, N. Y.

NILACUPTA, PRAYOTE, (s) Chulalongkorn Univ., Bangkok, Thailand, 71, Soi Sukothai 1, Rasvithy Rd., Bangkok, Thailand.

NILES, ALLEN W., (m) Physicist, Vanguard Project, Naval Research Lab., Washington 25, D. C. Home: Apt. 202, 4919 Deal Dr., Washington 21, D. C.

NILSSON, FREDERICK W., (a) Airport Designer, Aviation Department, The Port of New York Authority, 111—8th Ave., New York 11, N. Y. Home: 17 Danna Way, Rochelle Park, N. J.

NISCHWITZ, NED ROBERT, (s) Zelair Corporation, RFD #1, Defiance, O. Home: 730 Summit, Defiance, O.

NOBLE, JOHN D., (s) Defiance College, Defiance, O. Home: Fayette, O.

NOCKE, HENRY H., (m) Project Chemist, Thiokol Chemical Corp., Redstone Div., Huntsville, Ala. Home: 113 Surrey Rd., Huntsville, Ala.

NOEGGERATH, WOLFGANG C., (m) Research Specialist, Missile Systems Div., Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 5125 Kelvin Ave., Woodland Hills, Calif.

NOLAN, BEAMAN B., (m) Sen. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 17891 Ridgeway Rd., Granada Hills, Calif.

NOLAN, JAMES R., (m) Senior Design Engr., Power Plant, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 3925 Medford Rd., Ft. Worth, Tex.

NOLAND, ROBERT L., (m) Executive Vice President, Reinhold Engineering and Plastics Co., 12827 E. Imperial, Norwalk, Calif. Home: 2138 Royal Oaks, Duarte, Calif.

NORBY, LARRY D., (a) Cartographic Aide, Survey Section, 6550 Installation Gp., Patrick Air Force Base, Fla. Home: 1233 W. Peachtree St., Cocoa, Fla.

NORD, WILLIAM J., (m) Development Engr., Systems & Controls Dept., Aerojet-General Corp., Sacramento, Calif. Home: 309—21st St., Manhattan Beach, Calif.

NORDLINGER, S. G., (m) Industrial and Engineering Consultant, Box 6325, Washington, D. C. Home: 4000 Oliver St., Chevy Chase, Md.

NORDSTROM, CARL J. III, (m) Assoc. Res. Engr. "A", Guidance & Test Division, Bomarc Proj., Boeing Airplane Co., Plant II, Seattle, Wash. Home: 13832 20th Ave., So. Seattle 88, Wash.

NORDYKE, S. E., (m) Proj. Engr., Industrial Engng. Research, 3000 Chesser Boyer Rd., Ft. Worth, Tex. Home: 919 Cedar Springs Terrace, Arlington, Tex.

NORELIUS, MARVIN L., (m) Associate Res. Engr., Boeing Airplane Co., Seattle, Wash. Home: Rt. #2, Box 7010, Issaquah, Wash.

NORMAN, NEIL, (a) Test Engr., Pratt & Whitney Aircraft, Main St., East Hartford, Conn. Home: 19 Conlin Dr., Thompsonville, Conn.

NORMAN, RONALD F., (s) Bell Aircraft Corp., Buffalo, N. Y. Home: 115 Military Rd., Buffalo 7, N. Y.

NORRIS, R. HOSMER, (m) Consulting Engr., General Electric Co., 1 River Rd., Schenectady 5, N. Y. Home: 1385 Regent St., Schenectady 9, N. Y.

NORTHRUP, ARVIN, (m) Military Sales Rep., Aircraft Div., Kaiser Metal Products, Inc., Bristol, Pa. Home: Buckingham, Bucks County, Pa.

NOSKA, CHARLES G., (m) President, Charles G. Noska Company, 501 West Chelten Ave., Phila. 44, Pa. Home: Cricket Rd., Whitemarsh, Pa.

NOST, M. CHAPMAN, (m) Chief Engr., Mecca Cable & Service Co., 2337 Bissonet, Houston 5, Tex. Home: 1324 Neeley Dr., Houston 24, Tex.

NOTHMANN, GERHARD A., (m) Manager, Dept. of Mechanism & Dynamics Res. Brn., Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill. Home: 5968 W. Erie St., Chicago 44, Il.

NOWAK,, JOHN J., (m) President, Lowenjon Laboratories Inc., 701 Seneca St., Buffalo 10, N. Y. Home: 41 Burke Dr., Buffalo 15, N. Y.

NUSBAUM, MILTON S., (m) Associate Engr., Propulsion Div., Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill. Home: 8350 S. Bennet Ave., Chicago, Ill.

NUSSDORFER, THEODORE J., JR., (m) Res. Engr., Arthur D. Little, Inc., 30 Memorial Dr., Cambridge, Mass. Home: 23 Blossomcrest, Lexington, Mass.

NYLIN, NELS E., (m) Sr. Des., Aerojet-General Corp., Box 1947, Sacramento, Calif. Home: 911 School St., Folsom, Calif.

O

OBERG, CYRIL D., (a) Mgr., Contracts Division, Solar Aircraft Company, 220 Pacific Highway, San Diego 12, Calif. Home: 3724 Pio Pico, San Diego 6, Calif.

O'BRIEN, MORROUGH P., (m) Dean, College of Engineering, University of California, 215 Engineering Bldg., Berkeley 4, Calif. Home: 1570 LaVereda, Berkeley 8, Calif.

O'BRIEN, RICHARD W., (a) WPTZ, Westinghouse Broadcasting Corp., Phila. 3, Pa. Home: 811 Inverness La., Phila. 28, Pa.

O'CONNOR, JOHN P., (a) Electrical Engr., Naval Research Laboratory, Anacostia 25, Washington, D. C. Home 3807 First St., S.E., Washington, D. C.

O'CONNOR, WILLIAM A., JR., (m) Sr. Publications Engr., Presentations, The Glenn L. Martin Company, Baltimore 3, Md. Home: 936 Chesaco Ave., Baltimore, Md.

ODEVSEFF, ALEC S., (m) Mgr., Military Engng., Beech Aircraft Corp., 9709 East Central, Wichita 1, Kan. Home: 933 No. Oliver, Wichita, Kan.

O'DONNELL, WILLIAM J., (m) Chief Development Engr., Republic Aviation Corporation, Conklin St., Farmingdale, L. I., N. Y. Home: 140 Maxson Ave., Freeport, L. I., N. Y.

OETTING, ROBERT B., (s) Purdue University, 128 North Grant, West Lafayette, Ind. Home: 9309 East 64th St., Raytown, Mo.

OFER, JOSEPH T., (m) Sr. Industrial Engr., Military & Industrial Services, J.P.L., Calif. Inst. of Tech., 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 1415 N. Holiston, Pasadena 6, Calif.

OGDEN, ALBERT S., (m) Chief Engr., Aircraft Division, Kaiser Metal Products, Inc., Bristol, Pa. Home: 44 Birch Dr., Levittown, Pa.

OGLE, HUGH MALCOLM, (m) Mgr., Control Systems Engng., General Engineering Laboratory, General Electric Co., 1 River Rd., Schenectady, N. Y. Home: 214 Juniper Dr., Schenectady, N. Y.

OKERLUND, ROBERT T., (s) Central Office Equipment Maint., Plant Division, Pacific Telephone and Telegraph Co., 8th So. & 148th Sts., Seattle 88, Wash. Home: 19530—4th Ave. So., Seattle 88, Wash.

OLDRIEVE, ROBERT E., (m) Aero. Res. Scientist, NACA, 21000 Brookpark Rd., Cleveland, O. Home: 7914 Spring Garden Rd., Cleveland 29, O.

OLDAKER, CARL R., (m) Field Service Engr., AiResearch Manufacturing Co., Los Angeles, Calif. Home: 625 E. Edgemoor, Wichita, Kan.

OLIVER, JAMES S., (s) Purdue University, Box 705, S. Cary, W. Lafayette, Ind. Home: RFD #1, Akron, Ind.

OLIVETO, FRANK J., (a) Process Engr., Defense Operations Div., Chrysler Corporation, 6230 John-R, Detroit 31, Mich. Home: 21307 Brierstone, Harper Woods 36, Mich.

OLSEN, MARVIN N., (m) Chief Physicist, Physics Department, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 255 Speedwell Ave., Morristown, N. J.

OLSEN, MILO R., (m) Test Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 7062 Valjean, Van Nuys, Calif.

OLSON, NORMAN O., (s) Electronic Technician, Nike, "C" Btry., AAA, MSL, Bn., United States Army, Ft. Niagara, Youngstown, N. Y. Home: 2519 Hennepin Ave., Apt. 5, Minneapolis 5, Minn.

OLSON, RAMON L., (m) Supervising Res. Engr., Mechanics Res. Dept., American Machine & Foundry Co., 1104 S. Wabash, Chicago 5, Ill. Home: 18545 Gladville, Homewood, Ill.

OLSON, ROBERT K., (a) Placement Specialist, Aircraft Gas Turbine Division, General Electric Company, Cincinnati 15, (Evendale), O. Home: 5877 Ross Rd., Hamilton, O.

OLSON, WALTER T., (m) Chief, Fuels & Combustion Research Division, NACA, Lewis Flight Propulsion Laboratory, 21000 Brookpark Rd., Cleveland 11, O. Home: 3829 W. 160th St., Cleveland 11, O.

O'MALLEY, JAMES A., JR., (m) Project Aerodynamicist, Engng., Bell Aircraft Corp., P. O. Box One, Buffalo 5, N. Y. Home: Rt. 2, Townline Rd., N. Tonawanda, N. Y.

OMAN, WILLIAM S., (a) Director of Sales, G. M. Giannini & Co., Inc., 969 N. LaBrea Ave., Hollywood, Calif. Home: 190646 Wells Dr., Tarzana, Calif.

OMOHUNDRO, PAUL, (m) Pres., Paul Omohundro Co., P. O. Box 696, 15506 S. Lakewood Blvd., Paramount, Calif. Home: 9440 E. Nichols, Bellflower, Calif.

OMORI, THOMAS T., (m) Sr. Engr., Aerojet-General Corp., Azusa, Calif. Home: 3092 Olive Ave., Altadena, Calif.

O'NEILL, JOHN J., JR., (m) Assist. to V. P. and Gen. Mgr., Explosives Div., Olin Mathieson Chem. Corp., East Alton, Ill. Home: 1245 Fairway Dr., Alton, Ill.

O,NEILL, LOUIS T., (m) Sales Manager, Aeronautical Products, Propeller Division, Curtiss- Wright Corporation, P. O. Box 351, Caldwell, N. J. Home: 63 Laurel Hill Rd., Mountain Lakes, N. J.

O'NEILL, W., (m) President and Chairman of the Board, The General Tire & Rubber Co., 1708 Englewood Ave., Akron 9, O. Home: 1290 West Exchange St., Akron 2, O.

OPPENHEIM, ANTONI K., (m) Associate Professor of Mathematical Engng., University of California, Berkeley, Calif. Home: 139 York Ave., Berkeley 8, Calif.

ORDIN, PAUL M., Chief, Fluid Systems Branch, NACA, Lewis Flight Prop. Lab., 21000 Brookpark Rd., Cleveland 11, O. Home: 3694 Lindholm Rd., Shaker Heights 20, O.

ORDWAY, FREDERICK I., III., (m) Executive Vice President, General Astronautics Corporation, West Shore Rd., Oyster Bay, N. Y.

ORILLION, ALFRED G., (a) Tech. Engr., Aircraft Nuclear Propulsion Project, General Electric Co., Idaho Falls, Idaho. Home: 284 W. 21st, Idaho Falls, Idaho.

O'ROURKE, NEIL W., (m) Power Plant Engr., Ryan Aeronautical Co., Lindbergh Field, San Diego, Calif. Home: 621 Carla Way, LaJolla, Calif.

ORR, ELSIE C., (m) Res. Engr., North American Aviation, Inc., 6329-49 E. Slauson, Los Angeles, Calif. Home: 3637 Kalsman Dr., Los Angeles 16, Calif.

ORR, JERRY A., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 7433 Loma Verde Ave., Canoga Park, Calif.

ORSINO, ANTHONY, (m) Engr., General Electric Co., Schenectady, N. Y. Home: 201 Linden St., Schenectady, N. Y.

ORTLIEB, RICHARD, (a) Designer, Controls, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 11204 Monogram St., Granada Hills, Calif.

ORTLOFF, CHARLES R., (s) Brooklyn Polytechnic Institute, B'klyn, N. Y. Home: 110-38 207th St., St. Albans 29, N. Y.

OSBORN, HAROLD F., (m) Washington Representative, Dept. 100, Aerojet-General Corporation, 615 Cafritz Bldg., 1625 Eye St., N.W., Washington, D. C. Home: 7801 Whittier Blvd., Bethesda, Md.

OSBORN, JOHN R., (s) Res. Assist. & Instructor, Purdue University, Lafayette, Ind. Home: 1409 Center, Lafayette, Ind.

OSBORNE, DAVID A., (s) Purdue University, W. Lafayette, Ind. Home: 528 SW 15th St., Richmond, Ind.

OSKAY, VURAL, (s) Graduate Assist., Aeronautical Engng. Dept., Rensselaer Polytechnic Institute, Troy, N. Y. Home: Room 309, Mason House, 180 8th St., Troy, N. Y.

OSLADIL, STANLEY, (a) Project Engr., Kearfott Co., 1150 McBride Ave., Little Falls, N. J. Home: 336 11th Ave., Paterson 4, N. J.

OSTERHOF, H., JUDSON, (m) Dir. of Res., Research Div., Goodyear Tire & Rubber Co., Akron, O.

OSTROFF, HAROLD H., (m) Chief Propulsion Engr., Helicopter Div., McDonnell Aircraft Corporation, P. O. Box 516, St. Louis 3, Mo. Home: 335 Wesley Ave., Ferguson 21, Mo.

O'TOOLE, PATRICK J., (s) 2nd Lieutenant, Air Performance Engineer School, U. S. Air Force, Box 565, 3536 Student Sqdn., Mather AFB, Calif. Home: 58 Grand St., New Rochelle, N. Y.

OWEN, DARREL M., (s) Jr. Engr., Physical Research Staff, Boeing Airplane Company, P. O. Box 3107, Seattle 14, Wash. Home 4710 17 Ave. N. E., Seattle 5, Wash.

OWEN, LEWIS D., (s) Home: 2657 Woodbine Dr., Pontiac, Mich.

OWENS, RALPH, (m) Harvey Machine Co., 19200 S. Western Ave., Torrence, Calif. Home: 3832 Palos Verdes Dr., N. Palos Verdes Estates, Calif.

OWENS, RICHARD H., (m) Experimental Res. Engr., North American Aviation, Inc., Downey, Calif. Home: 3832 Palos Verdes Dr., No. Palos Verde Estate, Calif.

OWENS, THOMAS W., (a) Laboratory Technician, Chemical Div., Aerojet-General Corporation, Azusa, Calif. Home: 3333 No. Walnut Grove, Rosemead, Calif.

OYER, KARL J., (m) Electronics Technician, USN, USS Badoeng Strait (CVE 116) FPO, San Francisco, Calif. Home: 907 Fifth St., Santa Monica, Calif.

P

PACE, THOMAS C., (a) Engr., RCA Service Co., Inc., Range Implementation, AFMTC, Patrick AFB, Fla. Home: 442 Highland Ave., Eau Gallie, Fla.

PAGE, ESTERLY C., (m) President, Page Communications Engineers, Inc., 710 14th St., N.W., Washington, D. C. Home: 1500 Massachusetts Ave., N.W., Washington, D. C.

PAGE, GEORGE A., JR., (m) Vice President, Research & Engng., Aeronca Mfg. Corp., Middletown, O. Home: Rt. 1, Reynoldsburg, O.

PAGE, VIRGINIA ERWIN, (m) Engr., Res., Page Communications Engineers, Inc., 710 4th, N.W., Washington, D. C. Home: 1500 Massachusetts Ave., N.W., Washington, D. C.

PAGET, HAROLD D., (a) Assistant Proj. Engr., Research Division, Continental Aviation and Engineering Corp., 12700 Kercheval, Detroit 15, Mich. Home: 2926 Springle, Detroit 15, Mich.

PAIEWONSKY, BERNARD H., (s) 2nd Lieutenant, WADC, U. S. Air Force, Wright Patterson Air Force Base, O. Home: 5871 Foulois Dr., Dayton, O.

PAISS, HAL, (m) Service Engr. (Operations Analysis), Weapon Systems Analysis, Northrop Aircraft, Inc., Hawthorne, Calif. Home: 9017 Burton Way, Los Angeles 48, Calif.

PALEN, PETER H., (m) Mgr., Valve Division, Bergen Engineering & Development Corp., Teterboro, N. J. Home: 165 Morris Ave., Mountain Lakes, N. J.

PALLEY, I. NEVIN, (m) Vice President, Engng., Temco Aircraft Corporation, P. O. Box 6191, Dallas, Tex. Home: 10151 Rosser Rd., Dallas, Tex.

PALLO, JOHN G., (m) Chief, Armament Division, Hdqts. Air Materiel Force, Europe, APO 633, New York, N. Y. Home: 76 LeRoy Ave., Yonkers, N. Y.

PALMER, ROBERT LEE, (a) Sr. Draftsman, Guided Missile Division, Firestone Tire & Rubber, 2525 Firestone Blvd., Los Angeles, Calif. Home: 4524 E. 57th St., Maywood, Calif.

PALMER, SIDNEY CHRISTIAN, (m) General Mgr., Aviation Gas Turbine Division, Westinghouse Electric Corporation, P. O. Box 2?8, Kansas City, Mo. Home: 50 Mayfair Dr., Pittsburgh 28, Pa.

PALMORE, JULIAN I., 3rd., (s) Home: Hopkins Apt., 3100 St. Paul St., Baltimore 18, Md.

PALMTAG, HERBERT M., (a) Missile Sales, Solar Aircraft Co., 2200 Pacific Hwy., San Diego 12, Calif. Home: 750 Gage Dr., San Diego 6, Calif.

PALUDAN, CHARLES T. N., (m) Physicist, Guidance and Control Labs., Army Ballistic Missiles Agency, Redstone Arsenal, Huntsville, Ala. Home: 1913 Hastings Rd., Huntsville, Ala.

PANEK, GERALD, (s) Parks College, E. St. Louis, Ill. Home: 45?2 Monitor Ave., Chicago, Ill.

PARFITT, VAUGHN R., (s) Purdue University, West Lafayette, Ind. Home: 701 N. Chauncey Ave., W. Lafayette, Ind.

PARILLA, ARTHUR R., (a) Engr., Curtiss Wright Corp., Caldwell, N. J. Home: 34 Crestview Rd., Mountain Lakes, N. J.

PARKER, EDWARD H., (m) Associate Engr., Power Plant, Douglas Aircraft Company, 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 2521—28th St., Santa Monica, Calif.

PARKER, FRANK A., Jr., (m) Dir., Atomic Energy Division, American-Standard, 1682 Broadway, Redwood City, Calif. Home: 530 Grace Dr., Menlo Park, Calif.

PARKER, GILBERT R., (a) Chief Chemist, East Chicago Plant, Metal & Thermit Corp., East Chicago, Ind. Home: 2309 169th St., Hammond, Ind.

PARKER, MAURICE E., (m) Experimental Projects Engr., Research & Engng., Reaction Motors, Inc., Denville, N. J. Home: Box 1445, Sparta, N. J.

PARKER, RICHARD S., (m) Electronic Engr., Engng. Department, Convair, A Division of General Dynamics Corp., Pomona, Calif. Home: 4458 Oakwood Place, Riverside, Calif.

PARKINS, WRIGHT A., (m) Engng. Manager, Pratt & Whitney Aircraft, Division of United Aircraft, 400 Main St., E. Hartford, Conn. Home: Ferncliff Dr., W. Hartford, Conn.

PARKINSON, DAVID B., (m) Gen. Engr. Mgr., Brush Electronics Co., 3631 Perkins Ave., Cleveland, O. Home: 2572 Queenston Rd., Cleveland, O.

PARLANTE, ELMER J., (s) Indiana Tech. College, Ft. Wayne, Ind.

PARMAN, PAYTON E., (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: Y.M.C.A. Box 313, Ft. Wayne, Ind.

PARSONS, ROBERT E., (m) Development Engr., Solid Engine Division, Aerojet-General Corporation, Azusa, Calif. Home: 433 S. Dancove Dr., West Covina, Calif.

PARTRIDGE, ALFRED, (a) Inspector, USN, Port Newark, Bldg. 13, Newark 5, N. J. Home: 583 Newark Ave., Kenilworth, N. J.

PASTORE, MICHAEL W., (m) Sr. Project Engr., Associated Engineers, Inc., 1 Silver St., Agawam, Mass. Home: 9 John Peel Rd., W. Simsbury, Conn.

PATERSON, LAWSONE, (m) Contracting Engr., Sales, Consolidated Western Steel Div., of U. S. Steel Corp., P. O. Box 2015 Term. Annex, Los Angeles 54, Calif. Home: 930 E. Glenoaks, Glendale 7, Calif.

PATRICHI, MIHAI D., (m) Chief Engr., Missile Research Mfg. Corp., 14806 Oxnard St., Van Nuys, Calif. Home: 4912 Meaina Rd., Woodland Hills, Calif.

PATTERSON, ALLEN C., (s) Purdue University, 516 Northwestern, W. Lafayette, Ind. Home: LaGrange Rd., O'Bannon, Ky.

PATTERSON, JOSEPH V., (a) Jr. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 4306 Saltilla St., Woodland Hills, Calif.

PATTON, JAMES R., JR., (m) Mech. Engr., Jet Propulsion Res. & Dev. Div., Office of Naval Research, Washington, D. C. Home: 4201 Massachusetts Ave., N.W., Washington 16, D. C.

PAUL, BEN E., (m) Mechanics Research Dept., American Machine & Foundry, 8000 N. Nevada, Colorado Springs, Colo. Home: 1452 Wilks Place, Colorado Springs, Colo.

PAUL, LEWIS A., (m) President, Tru-Scale, Inc., 1123 No. Mosley, Wichita 5, Kan. Home: 2434 Coolidge, Wichita, Kan.

PAULBACH, ROBERT A., Sales Engr., Western Division, Resistoflex Corporation, 2919 Empire Avenue, Burbank, Calif. Home: 19736 Victory Blvd., Woodland Hills, Calif.

PAULOS, GEORGE, (s) Academy of Aeronautics, LaGuardia Airport, Flushing, N. Y. Home: 97-05 24th Ave., E. Elmhurst 69, N. Y.

PAVLIS, FRANK E., (m) Vice President, Engng. Dept., Air Products, Inc., P. O. Box 538, Allentown, Pa. Home: 2145 Livingston St., Allentown, Pa.

PAVLOSKY, JAMES E., (m) Engr., North American Aviation, Inc., 4300 E. Fifth Ave., Columbus, O. Home: 80 E. 14th Ave., Columbus, O.

PAVLOU, GEORGE, (s) Indiana Technical College, Fort Wayne, Ind. Home: 428 E. Berry St., Fort Wayne, Ind.

PAWLAK, JAMES L., (s) Home: 7021 W. Stuth Pl., West Allis, Wis.

PAYNE, HOWARD E., JR., (m) Technical Consultant & Mfgs. Rep. Home: 56 Beaverbrook Dr., Dayton 3, O.

PAZZI, JOE M., (a) Design Engr., Air Arm Division, Missile Prod. Design, Westinghouse Electric Corp., Baltimore 28, Md. Home: 95 Madison St., New York 2, N. Y.

PAZZI, RALPH B., (a) Contract Administrator, Missile Test Project, RCA Service Co., Inc., Patrick AFB, Fla. Home: 109 Barton Ave., Rockledge, Fla.

PEABODY, PRENTICE B., (m) Major USAF, Western Development Div., Hq. Air Research & Development Comd., 5740 Arbor Vitae St., Los Angeles 45, Calif. Home: 5645 W. 78 St., Los Angeles 45, Calif.

PEARSON, CHAS. ROBT., (m) Engng. Designer "A", Temco Aircraft Corp., P.O. Box 6191, Dallas, Tex. Home: 1601 Herschel St., Arlington, Tex.

PEARSON, MERWIN D., (s) University of Minnesota, Minneapolis, Minn. Home: 10101 Third Ave., So., Minneapolis 20, Minn.

PECK, M. EDWARD, (m) Transportation Agent, Sales Division, Trans World Airlines, 234 Stockton St., San Francisco, Calif. Home: 82 Idora Ave., San Francisco 27, Calif.

PEDERSON, HAAKON O., (m) Sr. Proj. Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 838 Pinewood Rd., Union, N. J.

PEEBLES, LESTER H., (m) Devel. Engr., JPL, California Institute of Technology, 4800 Oak Grove Dr., Pasadena 2, Calif. Home: 969 West Kent St., Altadena, Calif.

PEGG, WILLIAM J., (m) Engng. Coordinator, Guided Missile Laboratories, Hughes Aircraft Company, Culver City, Calif. Home: Park Central Hotel, New York, N. Y.

PEGHINY, ERNEST LEE (a) Circuit Project Engr., RCA Service Co., Bldg. 575-2, Patrick AFB, Fla. Home: 38 Fletcher, Melbourne, Fla.

PEINEMANN, MANFRED, (s) Brooklyn Polytechnic Institute, B'klyn, N. Y. Home: 33-57 28th St., Long Island City 6, N. Y.

PEIRSOL, JAMES H., Chief Engr., Engng., Cen-Vi-Ro Pipe Corp., 8610 Atlantic Blvd., South Gate, Calif. Home 14325 Aranza Dr., La Mirada, Calif.

PELHAM, JOSEPH E., (m) Project Engr., Testing Dept., Redstone Div., Thiokol Chem. Corp., Redstone Arsenal, Huntsville, Ala. Home: 528 Lowell Dr., Huntsville, Ala.

PELLISH, STEPHAN P., (s) Parks College, E. St. Louis, Ill. Home: 120 Glenview, Mankato, Minn.

PELTIER, FRANK D., (m) Director of Mech. Engng., Government & Industrial Div., Philco Corp., 4700 Wissahickon Ave., Philadelphia 44, Pa. Home: 949 Leonard Rd., Jenkintown, Pa.

PELTZ, GUNTHER F., (m) Design Engr., Test Division, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 2384 Fair Oaks Blvd., Sacramento 21, Calif.

PENDRAY, G. EDWARD, (f) Public Relations Counsel, Senior Partner, Pendray, Cook & Hoving, 55 West 42nd St., New York 36, N. Y. Home: 491 Westchester Ave., Crestwood, N. Y.

PENNER, S. S., (m) Assoc. Prof. of Jet Propulsion, California Institute of Technology, Pasadena, Calif. Home: 2008 Oakdale St., Pasadena 10, Calif.

PENNY, HARRY R., (a) Electronics Technician, Guided Missile Range Division, Pan American World Airways, Airforce Missile Test Center Base, Patrick AFB, Fla. Home: 333 Oak St., Eau Gallie, Fla.

PEOTTER, GENE W., (a) 3611th Observer Training Sqdn., USAF, a/c P. O. Box 220, Harlingen, Air Force Base, Tex. Home: 649 N. 4th Ave., Sturgeon Bay, Wisc.

PEPPLER, JOHN R., (m) Sr. Research Eng., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 19020 Sprague St., Tarzana, Calif.

PERELLE, CHARLES W., (m) President, American Bosch Arma Corporation, Garden City, N. Y.

PERKINS, KENDALL, (m) Vice President-Engng., McDonnell Aircraft Corp., P. O. Box 516, St. Louis 3, Mo.

PERKINS, LINCOLN C., (s) Univ. of Conn., Storrs, Conn. Home: 19 Mallove Dr., New London, Conn.

PERRY, BERNARD A., (m) Electronics Engr., WSSCA, White Sands Proving Ground, N. M. Home: 1432 Lee's Dr., Las Cruces, N. M.

PERRY, EDWARD C., JR., (m) Group Leader, Res. Dept., United Aircraft Corp., E. Hartford, Conn. Home: 20 White St., Rockville, Conn.

PERRY, SAMUEL O., (m) Assist. Chief Engr.—Missile Projects, Engng. Dept., Chance Vought Aircraft, Inc., P. O. Box 5907, Dallas 22, Tex. Home: 1808 Pilgrim Dr., Irving, Tex.

PESCHKE, WILLIAM T., (s) Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y. Home: 1351 Eggert Place, Far Rockaway 91, N. Y.

PETERS, ALPHONSE P., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 6608 Centralia St., Lakewood, Calif.

PETERS, G. F., (a) Home: 1453 Hubbard St., Detroit, Mich.

PETERS, WESLEY H., (m) Aerophysics Department, Goodyear Aircraft, 1210 Massillon Rd., Akron 15, O. Home: 452 Molane Ave., Akron 13, O.

PETERSEN, NORMAN V., (m) Engr., Airborne Weapons Systems Department, Sperry Gyroscope Company, Mail Station O-41, Great Neck, N. Y. Home: 66 Corncrib Lane, Levittown, N. Y.

PETERSON, BENJAMIN G., (m) Supervisor-Aerodynamics Project, North American Aviation, Inc., International Airport, Los Angeles 45, Calif. Home: 11122 So. Hobart Blvd., Los Angeles 47, Calif.

PETERSON, HOWARD S., (m) Division Engr.-Design, Rocket Design Div., The M. W. Kellogg Co., Ft. Danforth St., Jersey City, N. J. Home: 1660 Marlboro Rd., Glen Rock, N. J.

PETERSON, ROWLAND F., (a) Sales Mgr., Traid Corp., 4545 Sepulveda Blvd., Sherman Oaks, Calif. Home: 4128 Ventura Canyon Ave., Sherman Oaks, Calif.

PETERSON, JOSEPH J., (m) Assist. Mgr., Engng. & Research, Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: Box 400A, Route 2, Loomis, Calif.

PETERSON, W. JOHN, (m) Home: 258 Vineyard, Livermore, Calif.

PETRICK, JOSEPH R., (s) Parks College, E. St. Louis, Ill. Home: 205 S. 11th St., Quaktertown, Pa.

PETRIDES, THRACY, (a) Head, Advanced Systems Dept., Bulova Research & Dev. Labs., Div. of Bulova Watch Co., 62-10 Woodside Ave., New York 77, N. Y. Home: 30 Haven Ave., New York 33, N. Y.

PETROFF, ALEX N., (a) Dir. of Res., Cessna Aircraft Co., Wichita, Kan. Home: 1709 N. Holyoke, Wichita, Kan.

PETROZZI, PAUL J., (m) Rocket Res. Engr., Bell Aircraft Corp., Buffalo 1, N. Y. Home: 2844 Santa Paula Cts., Sacramento, Calif.

PETTEY, THOMAS M., JR., (m) Mgr., Equipment Engng., Special Defense Projects Dept., General Electric Co., 2900 Campbell Ave., Schenectady, N. Y. Home: 1479 Dean St., Schenectady 9, N. Y.

PFANNEBECKER, GEORGE W., (m) Res. Engr., Res. Dept., United Aircraft Corp., 400 Main St., E. Hartford, Conn., 13 Summit St., Manchester, Conn.

PFEIFFER, PAUL O., (m) Mgr., Central Development Department, The General Tire & Rubber Company, 1708 Englewood Ave., Akron 9, O. Home: 2909 Parkwood Dr., Silver Lake, Cuyahoga Falls, O.

PFOUTS, J. O., (m) Sr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 21228 Lopez St., Woodland Hills, Calif.

PHELAN, ARTHUR J., (m) Assist. to V. P. in Charge of Engng., Engng. Dept., AiResearch Mfg. Co., 9851 Sepulveda Blvd., Los Angeles 45, Calif. Home: 860 Castac Pl., Pacific Palisades, Calif.

PHILLIPS, JAMES F., (m) Secretary, Guided Missiles Committee, Aircraft Industries Association, 610 Shoreham Bldg., Wash. 5, D. C. Home: Union Farm, Mt. Vernon, Va.

PHILLIPS, MICHAEL, Cooper Union School of Engineering, Cooper Square, New York 3, N. Y. Home: 182 Bennett Ave., New York 40, N. Y.

PHILLIPS, N. VANCE, (m) Director, Phillips Laboratory, 1010 Monte Dr., Santa Barbara, Calif.

PHILLIPS, ROBERT F., (a) Inspector, Hughes Aircraft Co., Tucson, Ariz. Home: 3244 E. Waverly, Tucson, Ariz.

PHILIPSON, JOSEPH, (m) Western Representative, Atlantic Research Corp., Alexandria, Va. Home: 1485 Old House Rd., Pasadena 8, Calif.

PICHEL, MARLOWE A., (m) President and Gen. Mgr., Consolidated Research & Dev. Corp., 1532 S. Myrtle, Monrovia, Calif. Home: 5317 Harter Lane, LaCanada, Calif.

PICKARD, GEORGE W., III, (s) Home: 3125 S. Stafford, Arlington 6, Va.

PIECH, JOHN S., (m) Technical Staff, Guided Missile Research Division, The Ramo-Wooldridge Corporation, 5760 Arbor Vitae St., Los Angeles 45, Calif. Home: 5400 Seventh Ave., Los Angeles 43, Calif.

PIERCE, DONALD E., (m) Assist. Mgr., Equipment Department, Brush Electronics Company, 3405 Perkins Ave., Cleveland 14, O. Home: 2206 Westminster Rd., Cleveland Heights, O.

PIERCE, GEO. E., (m) Engr.-in-Charge, I.B.M. Corp., Box 388, Alamogordo, N. M. Home: 407 Lovers Lane, Alamogordo, N. M.

PIERCE, JACK B., (m) Devel. Engr., Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 2016 Ceres Way, Sacramento 21, Calif.

PIERCE, JAMES G., (a) President, Technical Specialties Inc., 50 W. Maple St., Columbus 15, O. Home: 726 E. Cooke Rd., Columbus 14, O.

PIERCE, JAMES R., (m) Dev. Engr., Aerojet-General Corp., Azusa, Calif. Home: 4630 Woodley Ave., Encino, Calif.

PIERONI, VERDY J., JR., (s) Technical Staff, Aerodynamics Dept., Hughes Aircraft Company, Culver City, Calif. Home: 11200 Regent St., Los Angeles 34, Calif.

PIERSON, ARTHUR H., (s) University of Michigan, Ann Arbor, Mich. Home: 1000 Oakland, Ann Arbor, Mich.

PIERSON, REX E., JR., (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: 1715 Illinois St., Ft. Wayne, Ind.

PIET, MEYER, (m) Pres., Futurecraft Corp., 1717 No. Chico Ave., El Monte, Calif. Home: 757 Anoakia La., Arcadia, Calif.

PIETROS, ROGER W., (s) Univ. of Michigan, Ann Arbor, Mich.

PIETSCH, ANTHONY (m) Tech. Engr., General Electric Co., Evendale 15, O. Home: 1483 Larrywood La., Cincinnati 24, O.

PINKEL, GEORGE E., (m) Associate Engr., Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: Douglas Aircraft Co., White Sands Proving Ground, N. M.

PINO, M. A., (m) Res. Engr., Chemicals Division, California Research Corporation, Richmond, Calif. Home: 1657 San Benito St., Richmond 6, Calif.

PITCHER, ROBERT R., (m) Project Leader, Engng., Redel Incorporated, 401 E. Julianna, Anaheim, Calif. Home: 621 S. Palm, Anaheim, Calif.

PITKIN, EDWARD T., (m) Air Reduction Co. Fellow, Princeton University, Forrestal Research Center, Princeton, N. J. Home: R.F.D. #2, Putnam, Conn.

PITTMAN, EARLE S., (a) U. S. Air Force, 3420 Sturon, Lowry AFB, Denver 8, Colo. Home: 115 S. Brainard, La Grange, Ill.

PLACE, E. WILLIAM, (m) Mgr., Guided Missile Prod. Div., Beckman & Whitley, Inc., 985 San Carlos Ave., San Carlos, Calif. Home: 124 Tan Oak Drive, Menlo Park, Calif.

PLATELL, OVE B., (m) Servo-engineer, Servo Dept., SAAB Aircraft Company, Platensgatan 25, Linkoping, Sweden. Home: Pratbolsgaten 1, Linkoping, Sweden

PLATH, ROBERT, (m) Project Engr., Pilotless Aircraft Div., Boeing Airplane Co., P.O. Box 3107, Seattle 14, Wash. Home: 8818 40th S.W., Seattle 14, Wash.

PLATZ, EDWARD H., JR., (m) Mgr., Alloy Sales, Lebanon Steel Foundry, Lehman St., Lebanon, Pa. Home: 339 So. 8 St., Lebanon, Pa.

PLATZ, GERALD M., (m) Assistant Supervisor, Propellants Chemistry Research, Dept. of Chemistry and Chemical Engineering, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill. Home: 607 Cambridge, Elmhurst, Ill.

PLOTSKY, NORMAN, (a) New York University, Bronx 53, N. Y. Home: 214 E. 168th St., New York 56, N. Y.

PLUMMER, LOUIS P., (m) Major, Hq. 3520, M & S Group, McConnell AFB, Wichita, Kan. Home: 12200 E. Lynn, Wichita, Kan.

POLAK, HENRI, Scientific Attache, Netherlands Embassy, 1470 Euclid St., Washington, D. C. Home: 3301 E. Woodbine St., Chevy Chase, Md.

POLIKOFF, ROUVIME B., (m) Vice President, Seamless Products Co., Inc., 126 11th Ave., New York 11, N. Y. Home: 276 Riverside Dr., New York 25, N. Y.

POLLARD, FRANK B., (m) Technical Services, Aerophysics Development Corporation, P. O. Box 949, Santa Monica, Calif. Home: 2801 Valley Dr., Manhattan Beach, Calif.

POMEROY, ANDREW L., (m) Associate Director, Staff Res. and Development, Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, O. Home: 19630 Winslow Rd., Shaker Heights 22, O.

POMPA, MICHAEL FRANCIS, (m) Des. Engr., Liquid Engine Div., Aerojet-General Corp., Azusa, Calif. Home: 383 No. Laurel Ave., Upland, Calif.

POOL, LEONARD P., (m) President, Air Products, Inc., P. O. Box 538, Allentown, Pa. Home: R.D. 1, Allentown, Pa.

POPULO, JOSEPH J., (s) Academy of Aeronautics, LaGuardia Airport, Flushing, N. Y. Home: 73-33—69th Place, Glendale 27, N. Y.

PORTAS, WILLIAM R., (m) Des. Engr., Thiokol Chemical Corp., Redstone Arsenal, Huntsville, Ala. Home: 1307 Cleveland, Pascoyceulo, Miss.

PORTER, RICHARD N., (m) Engng. Assistant to the Chief, Test Operations Branch, Rocket Engine Test Laboratory, Air Force Flight Test Center, Edwards Air Force Base, Edwards, Calif. Home: P. O. Box 423, Boron, Calif.

PORTER, R. W., (m) Chief Engr., Precision Comp. Div., Norden-Ketay Corp., 555 Broadway, New York 12, N. Y. Home: 44 Northwest Dr., Northport, N. Y.

PORTER, RICHARD W., (m) Consultant-Engng. Services, General Electric Co., 570 Lexington Ave., N. Y. C. Home: Cat Rock Rd., Cos Cob, Conn.

POSCH, RALPH F., (m) Sr. Propulsion Engr.,Propulsion Dept., Chance Vought Aircraft Corp., Dallas, Tex. Home: 2541 Rolinda Dr., Dallas, Tex.

POSTON, ERNEST, (m) Design & Devel. Engr., Aero. Div., Minneapolis-Honeywell Reg. Co., 2600 Ridgeway Rd., Minneapolis 13, Minn. Home: 3008 31st Ave., N.E., Minneapolis 18, Minn.

POTTER, ROBERT L., (m) Combustion Research Group Leader, Bell Aircraft Corp., Buffalo 5, N. Y. Home: 32 Miller Rd., R.D. #1, Niagara Falls, N. Y.

POUCHOT, WALTER D., (m) Section Engr., Combustion Development, Aviation Gas Turbine Engrg. Dept., Westinghouse Electric Corp., P.O. Box 288, Kansas City, Mo. Home: 9012 Hardy Dr., Overland Park, Kan.

POWELL, ROBERT R., (m) Missile Test Engr., Field Test Division, Radioplane Company, 8000 Woodley, Van Nuys, Calif. Home: P.O. Box 392, Holloman AFB, N. M.

POWELL, WALTER B., (m) Engng., Specialist, JPL, California Inst. of Tech., 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 772 Morado Pl., Altadena, Calif.

POWELL, WILLIAM C., Engng. Test Pilot, Flight Test, Bell Aircraft Corp., P.O. Box 5, Buffalo 1, N. Y. Home: 449 Lakewood Pkwy., Snyder 21, N. Y.

PREBLE, RICHARD G., (a) Engr., Cinerama Incorporated, P.O. Box 120, Oyster Bay, N. Y. Home: 96 Albatross Road, Levittown, N. Y.

PREECE, BETTY P., (m) Home: 8816 Ramsgate Ave., Los Angeles 45, Calif.

PREECE, RAYMOND G., (m) Tech., Liasion Engr., Field Engng. Div., Hughes Aircraft Co., Culver City, Calif. Home: 8816 Ramsgate Los Angeles 45, Calif.

PRESING, JOSEPH A., JR., (m) Sr. Des. Engr., North American Aviation, Inc., 6349 E. Slauson Ave., Los Angeles, Calif. Home: 83[illegible]2 Wilbur Ave., Northridge, Calif.

PRESS, MARTIN, Sr. Proj. Engr., Federal Telecommunication Laboratories, Division of International Telephone and Telegraph Corp., Nutley, N. J. Home: 240 E. Palisade Ave., Englewood, N. J.

PRESSLEY, ELEANOR, (m) Mathematician, Naval Res. Lab., Washington, D. C. Home: 2410—33rd St., S.E., Washington, D. C.

PRICE, EDWARD W., (m) Head, Fluid Dynamics Branch, Research Department, U. S. Naval Ordnance Test Station, Code 5014, China Lake, Calif. Home: 513-A Nimitz, China Lake, Calif.

PRIGGE, JOHN S., JR., (m) Proj. Leader, Aerophysics Research Group, Massachusetts Institute of Technology, Cambridge 39, Mass. Home: 23 Holden Wood Rd., Concord, Mass.

PRINCE, DAVID C., (m) Consulting Engr. Home: 50 Washington Ave., Schenectady 5, N. Y.

PRO, WILBUR F., (m) Rocket Propulsion Systems Engr., Missile Engng., Beech Aircraft Corp., 9709 E. Central, Wichita, Kan. Home: 2818 Glen Oaks Dr., Wichita 16, Kan.

PRUDDEN, TERRY M., (m) Proj. Engr., Liquid Engine Division, Aerojet-General Corp., Azusa, Calif. Home: 209 Via Cordova, Newport Beach, Calif.

PRUTTON, CARL F., (m) Vice President and Technical Director, Administrative Offices — Chemical Divisions, Food Machinery & Chemical Corp., 161 East 42nd St., New York 17, N. Y. Home: 350 East 57th St., New York, N. Y.

PRUVENOK, ANDREW J., (s) Purdue University, Box 425, Residence "X", Lafayette, Ind. Home: 614 Durbin St., Gary, Ind.

PRUYN, RICHARD R., (a) Aerodynamicist, Aerodynamics Dept., Kellett Aircraft Corp., Airport Circle, Camden 1, N. J. Home: 125 Widener St., Philadelphia 20, Pa.

PRYBYLSKI, JOHN R., (m) Des. Engr., Rocket Div., Bell Aircraft Corporation, P. O. Box 1, Buffalo 5, N. Y. Home: 1673 Broadway, Buffalo 12, N. Y.

PRYOR, SAMUEL F., (m) Vice President and Assistant to President, Pan American World Airways, 135 East 42nd St., New York, N. Y. Home: Field Point Park, Greenwich, Conn.

PUCKETT, EUGENE A., (a) Bendix Aviation, Hamilton, O. Home: 1737 Helen Ave., Hamilton, O.

PURDY, WILLIAM G., (m) The Glenn L. Martin Co., P.O. Box 179, Denver, Colo. Home: 14425 W. 19th Pl., Applewood Hills, Denver, Colo.

PUTNAM, ABBOTT A., (m) Assistant Division Chief, Aeronautics & Thermodynamics Division, Battelle Institute, 505 King Ave., Columbus, O. Home: 478 Arden Rd., Columbus 14, O.

Q

QUANTZ, CHESTER C., (m) Chief Eng., Electro-Mechanical Products Co. 32700 Ford Rd., Garden City, Mich.

QUARTERMAN, EDWARD A., Commander, USNR, Naval Res. Aviation So., 12-10 NABPD, San Bruno, Calif. Home: Rt. 1, Box 61, Livermore, Calif.

QUANTZ, RAOUL J., Captain, U. S. Army, Aberdeen Proving Ground, Md. Home: 307-A East Court Rd., Aberdeen, Md.

QUESADA, E. R., (m) Home: 10430 Bellagio Rd., Los Angeles 24, Calif.

QUEEN, ROY L., (m) Assistant Chief Engr., Test Division, Aerojet-General Corporation, Azusa, Calif. Home: 808 Lolita St., W. Covina, Calif.

QUIGLEY, CHARLES E., (a) Electrical Engr., Naval Research Laboratory, Washington 25, D. C. Home: 7003 Hillcrest Pl., Chevy Chase 15, Md.

R

RACICOT, PAUL GERALD, Dev. Engr., Aerojet-General Corp., LRP, Box 1947, Sacramento, Calif. Home: 1343 61st St., Sacramento 19, Calif.

RACISZ, STANLEY F., (m) Aerodynamicist, Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 396 Hewitt St., No. Tonawanda, N. Y.

RADD, HERBERT E., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 2601 Geddes, Ann Arbor, Mich.

RADEMAKER, JACK R., (s) University of Michigan, Ann Arbor, Mich. Home: 3423 Carpenter Rd., Ypsilanti, Mich.

RAFFEL, ZANVILLE M., (m) Proj. Supervisor, Thieblot Aircraft Co., Inc., 4924 Hampden La., Washington 14, D. C. Home: 921 Toppa Road, Towson, Md.

RAGSAC, ROBERT V., (s) Res. Engr., Preliminary Design, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 4411 Tepoca Rd., Woodland Hills, Calif.

RAGUSA, MICHAEL P., (s) Home: 446 San Vicente Blvd., Santa Monica, Calif.

RAHKONEN, PAAVO J., (s) Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y. Home: 816—43rd St., Brooklyn 32, N. Y.

RAICHE, LOUIS G., (m) Mgr., Aircraft, ACF Industries Incorporated, St. Charles, Mo. Home: 502 Jefferson, St. Charles, Mo.

RAINES, THADDEUS J., (m) Chief, Propellant Properties Dept., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 21 Green Acres Dr., Verona, N. J.

RAISEN, ELLIOTT, (m) Rocket Res. Engr., Propellant Laboratory, Bell Aircraft Corporation, Wheatfield, N. Y. Home: 4135 Isherwood Dr., Niagara Falls, N. Y.

RAITHEL, WILHELM, (m) Home: 38 Deborah Ave., Pittsfield, Mass.

RAKES, SAM L., (s) University of Arkansas, 611 N. Leverette, Fayetteville, Ark. Home: 208 S.E. 8th, Bentonville, Ark.

RAMELLA, FRANK O., (a) Shift Foreman, Chemical Division, Koppers Co., Inc., Pittsburgh 19, Pa. Home: 7228 Lemington Ave., Pittsburgh 6, Pa.

RAMO, SIMON, (m) Executive Vice President, The Ramo-Wooldridge Corporation, 5730 Arbor Vitae St., Los Angeles 45, Calif. Home: 276 Travistock Ave., Los Angeles 49, Calif.

RAMROTH, WILLIAM G., (m) Engr., Pilotless Aircraft Div., Boeing Airplane Co., Seattle, Wash. Home: 20234—15th Ave., So. Seattle 88, Wash.

RAMSAUER, WALTER R., (m) Vice Pres., AiResearch Mfg. Co. Div., The Garrett Corp., 9851 S. Sepulveda Blvd., Los Angeles, Calif. Home: 178 No. Carmelina, Los Angeles 49, Calif.

RANDALL, LOWELL N., (m) Rocket Powerplant Res. Engr., Liquid Propulsion Branch, EML, White Sands Proving Ground, N. M. Home: 1025 Circle Drive, Las Cruces, N. M.

RANDAZZO, DONALD J., (s) Brooklyn Polytechnic Institute, 99 Livingston St., Brooklyn, N. Y. Home: 1675 W. 2nd St., B'klyn 23, N. Y.

RANDOLPH, CARL, (m) Principal Chemist, Aerojet-General Corp., 6352 Irwindale Blvd., Azusa, Calif. Home: 1208 Galmosa Ave., Whittier, Calif.

RANEY, RUSSELL W., (s) Rensselaer Polytechnic Institute, Troy, N. Y. Home: 1223 West Sixth St., Erie, Pa.

RANSOM, EUGENE A., (a) Factory Mgr., Aero-Coupling Corp., 3015 Winona Ave., Burbank, Calif. Home: 11119 Runnymede St., Sun Valley, Calif.

RANSOM, WILL A., (m) Sr. Aircraft Des. Engr., Power Plant & Thermodynamics Dept., Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 305 College, Arlington, Tex.

RAPP, EDWARD G., (m) Sr. Proj. Engr., Staff Research & Development, New Devices, Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland 3, O. Home: 4844 Edsal Dr., Lyndhurst, Cleveland 24, O.

RAPP, LOUIS C., (m) Director of Chemistry, Res. & Eng. Div., Chemistry Dept., Reaction Motors, Inc., Denville, N. J. Home: 4 Meriden Manor, Rockaway, N. J.

RASQUIN, JOHN R., (m) Supervisor, Electrical Fabrication, Missile Operations, Chrysler Corporation, Box 2628, Detroit 31, Mich. Home: 36530 E. Jefferson, Mt. Clemens, Mich.

RATH, ROBERT E., (s) Home: 344 Sheridan Rd., Waterloo, Iowa.

RATHBUN, KENNETH C., (m) Res. Associate, Propulsion Department, Experiment, Incorporated, P. O. Box 1-T, Richmond 2, Va. Home: P. O. Box 463, Bon Air, Va.

RATHMELL, ALFRED R., (s) Indiana Technical College, 225 E. Washington Blvd., Ft. Wayne, Ind. Home: 3815 Magee Ave., Oakland 19, Calif.

RATTIN, EGAN T., (m) Res. Engr., Missile Systems Division, Lockheed Aircraft Co., Van Nuys, Calif. Home: 2415 Roscomare Rd., Los Angeles, Calif.

RAULINS, KENNETH R., (m) Mgr., RCA Service Co., Bldg. 561, Patrick AFB, Fla. Home: Star Route, S. Merritt Island, Fla.

RAVAUD, RENE R., (m) Cdr. Assistant Naval Attache, French Embassy, 1759 R St., N.W., Washington, D. C. Home: 3719 North Delaware St., Arlington, Va.

RAYNOR, SEVERIN, (m) Director, Mechanics Res. Dept., American Machine & Foundry, 1104 S. Wabash Ave., Chicago, Ill. Home: 1063 Ash, Winnetka, Ill.

REAGAN, JAMES F., (m) Mgr., Missile Engng., Beech Aircraft Corp., 9709 E. Central, Wichita, Kan. Home: 6220 E. Eighth, Wichita, Kan.

REALE, RICHARD P., (a) A.F.Q.C.R., Supv. A/C M. & E., USAF, San Bernardino Air Material Area, San Bernardino, Calif. Home: 5358 Natick Ave., Van Nuys, Calif.

REBELLO, FERNANDO P., (m) Engr., Centro Tecnico de Aeronautics, S. Jose Dos Campos, Sao Paulo, Brazil, South America.

REECE, JUDSON B., (a) Instrument Tech., Aircraft Nuclear Prop., Dept., General Electric Co., Box 132, Cincinnati, O. Home: Foster Park, Foster, O.

REED, DWIGHT H., (a) Shop Supervisor, Test Div., Aerojet-General Corp., Azusa, Calif. Home: 216 W. Live Oak St., San Gabriel, Cal..

REED, GEORGE A., (m) Field Test Director, Bell Aircraft Corp., Buffalo, N. Y. Home: 95 Oakwood Dr., Williamsville 21, N. Y.

REED, GEORGE W., Design Engr., Pilotless Aircraft Division, Boeing Airplane Co., 7755 E. Marginal, Seattle, Wash. Home: 4009 W. Trenton, Seattle 16, Wash.

REED, ROBERT J., (m) Conover-Mast Publications, Inc., 1900 Euclid Bldg., Room 702, Cleveland 15, O. Home: 1059 Maple Cliff Dr., Lakewood 7, O.

REES, EBERHARD F. M., (m) Mech. Engr., Redstone Arsenal, Huntsville, Ala. Home: Rt. 4, Box 96A, Huntsville, Ala.

REESE, BRUCE A., (m) Associate Professor of Mechanical Engng., Purdue University, Lafayette, Ind. Home: 3140 Longlois Dr., Lafayette, Ind.

REESE, JOHN S., (a) Cdr., U. S. Navy, Bureau of Ordnance, Rm. 4234, Main Navy, Washington 25, D. C. Home: Apt. 222 E. Huntington Tower, Alexandria, Va.

REICH, HERBERT, (m) Technical Staff, Design Integration, Guided Missile Division, Hughes Aircraft Co., Florence & Teale, Culver City, Calif. Home: 20656 Haynes St., Canoga Park, Calif.

REICHARD, EMERSON S., JR., (m) Mgr., Contracts Division, Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 590 No. Auburn, Sierra Madre, Calif.

REICHEL, RUDOLF H., (m) Rocket Develop. Engr., Bell Aircraft Corp., Buffalo 5, N. Y. Home: 290 Campus Dr., Buffalo 21, N. Y.

REICHENBACH, FRANK M., (s) Tufts College, 114 Curtis St., Medford 55, Mass. Home: 114 Curtis St., Somerville 55, Mass.

REID, CHARLES T., (m) Director of Engng., Northrop Aeronautical Institute, 1155 W. Arbor Vitae St., Inglewood, Calif. Home: 10939 Penny Ave., Inglewood, Calif.

REID, WILLIAM L., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: Box 65-H, Rte. 1, Simi, Calif.

REID, J. G., JR., (m) General Mgr., Electronics Div., ACF Industries, Inc., 30 Church St., New York, N. Y. Home: 800 N. Pitt St., Alexandria, Va.

REILLY, HUGH T., (m) Test Engr., Thiokol Chemical Corporation, Elkton, Md. Home: R.D. 3, Elkton, Md.

REIMER, RAY, (m) Missile Body Group Engr., Northrop Aircraft, Inc., Hawthorne, Calif. Home: 9475 South LaSalle Ave., Los Angeles 47, Calif.

REINHARDT, THOMAS F., (m) Rocket Res. Section Leader, Rocket Engine Dept., Bell Aircraft Corp., P. O. Box 1, Buffalo, N. Y. Home: 156 Meadow Lea Drive, Eggertsville 23, N. Y.

REINHARDT, WILLIAM J., (m) Tech. Planning, Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: Box 318, Sparta, N. J.

REISIG, GERHARD H. R., (m) Chief, Analytical Investigations Section, Aeroballistics Laboratory, Army Ballastic Missile Agency, Redstone Arsenal, Huntsville, Ala. Home: 504 Pratt Ave., Huntsville, Ala.

REISNER, JOSEPH H., (m) Staff Engr., Eastern Operations, Aeroquip Corporation, 128 South Prospect St., Hagerstown, Md. Home: 509 Gordon Circle, Hagerstown, Md.

REISSIG, ROBERT R., (m) Admin. Engr., Guided Missiles Div., Republic Aviation Corp., Hicksville, L. I., N. Y. Home: 11 Bay Drive East, Bay Hills, Huntington, L. I., N. Y.

REMY, RICHARD T., (m) Technical Staff, Radar R&D Div., Hughes Aircraft Company, Florence & Teale, Culver City, Calif. Home: 5380 Dobson Way, Culver City, Calif.

REVEL, NORMAN C., (m) Asst. Section Chief, Design & Development, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 23745 Long Valley Rd., Calabasas, Calif.

REX, JAMES F., (m) Lt. USN, ECMRON One (VQ-1), c/o FPO, San Francisco, Calif. Home: 3051 St. Paul Blvd., Rochester, N. Y.

REYNOLDS, J. LOUIS, (m) Director of Customer Relations Div., Marquardt Aircraft Co., 16555 Saticoy, Van Nuys, Calif. Home: 3961 Cody Rd., Sherman Oaks, Calif.

REYNOLDS, JAMES W., (m) Mfgng. Rep., Material Division, Aerojet-General Corp., Box 296, Azusa, Calif. Home: 439 W. Laurel Ave., Glendora, Calif.

REYNOLDS, ROBERT H., (m) Capt., Chief, Range Control Division, AFTC, Patrick AFB, Fla. Home: 157-A Northeast Dr., Patrick AFB, Fla.

RHODE, C. W., (m) Assist. Supv., Production Electronics Engr., Guided Missile Div., Firestone Tire & Rubber Co., 2525 E. Firestone Blvd., Los Angeles 54, Calif. Home: 9534 E. Cloverwood, Bellflower, Calif.

RHODES, GLEN L., (m) Mech. Engr., Missile Field Test, Boeing Airplane Co., Seattle, Wash. Home: Rt. 2, Box 329, Cocoa, Fla.

RIBANYI, PAUL, (m) Res. Engr., Boeing Airplane Co., Seattle, Wash. Home: 8410 Fauntleroy Place, Seattle 6, Wash.

RICE, CHARLES E., (m) Instrumentation Engr., Radioplane Company, 8000 Woodley Ave., Van Nuys, Calif. Home: 13443 Burbank Blvd., Van Nuys, Calif.

RICE, MILLARD LEE, (m) Director, Applied Mathematics and Interior Ballistics Div., Atlantic Research Corporation, 901 N. Columbus St., Alexandria, Va. Home: 955 Rollins Dr., Alexandria, Va.

RICE, PAUL J., (m) Res. Associate, Infrared Group, Willow Run Laboratories, University of Michigan, Ypsilanti, Mich. Home: 7313 Hartwell, Dearborn, Mich.

RICE, TOM R., (a) The Pacific Telephone & Telegraph Co., 102 E. Adler, Walla Walla, Wash. Home: 541 Pleasant St., Walla Walla, Wash.

RICHARDS, MURIEL M., (a) Pan American World Airways, Inc., 135 E. 42nd St., New York 17, N. Y. Home: 110 W. 55th St., New York 19, N. Y.

RICHARDSON, AL, (m) Technical Writer, Publications, JPL, California Institute of Technology, 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 453 Pamela Rd., Duarte, Calif.

RICHARDSON, EDWARD H., (s) Vanderbilt University. Home: Rt. #3, Dickerson Road, Goodlettsville, Tenn.

RICHARDSON, JOHN E., (m) Jr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 7901 Ostrom Ave., Van Nuys, Calif.

RICHARDSON, KEN L., (s) Home: 1315 W. Wabash, Enid, Okla.

RICHEY, JAMES D., (m) Technical Staff, Underwater Systems Development Dept., Bell Telephone Laboratories, Whippany, N. J. Home: 114 Franklin St., Bldg. 5, Apt. 62, Morristown, N. J.

RICHEY, WILLIS D., (s) University of Rochester, Rochester, N. Y. Home: 39 Stratford Pk., Rochester, N. Y.

RICHTER, RALPH P., (m) Mfng. Trainee, Turbine Dept., General Electric Co., Lynn River Works, Lynn, Mass. Home: 45 Lorraine Ave., Sch'dy., N. Y.

RICKLES, H., (m) Res. Engr., Esso Research & Engineering Co., P. O. Box 51, Linden, N. J. Home: 547 E. Grant Ave., Roselle Park, N. J.

RIDDLESBARGER, ROGER J., (m) Supervisor, North American Aviation, Inc., Downey, Calif. Home: 6957 Chimineas, Reseda, Calif.

RIDEOUT, WILLIAM H., (m) Chief Draftsman, Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 5337 Tiburon Way, Sacramento 21, Calif.

REIDEL, ELMER H., (a) Jr. Res. Engr., North American Aviation, Inc., 6349 E. Slauson Ave., Los Angeles, Calif. Home: 3615 5th Ave., La Crescenta, Calif.

RIEDEL, WALTER, (m) Mgr., Behr-Thomson, Inc., Mauserstr. 5, Stuttgart, Germany. Home: Lessing Str. 5, Stuttgart, Germany.

RIEGER, GEORGE F., (m) Engr., Guided Missiles Dept., General Electric Co., 2900 Campbell Ave., Schenectady, N. Y. Home: 2145 Fairview Ave., Schenectady 6, N. Y.

RIFKIN, SHELDON, (s) University of Buffalo, Buffalo, N. Y. Home: 162 N. Park Ave., Buffalo 16, N. Y.

RIGGS, RAMON WINSTON, (s) University of California, Berkeley 3, Calif. Home: 2224 Jefferson Ave., Berkeley, Calif.

RIGNEY, HENRY J., (a) Aircraft Quality Inspector, Leadman, Final Inspection, Kaiser Metal Prod. Co., Radcliffe St., Bristol, Pa. Home: 101 E. Endfield Rd., Feasterville, Pa.

RIGONI, ORLANDO P., (m) Foreman, U. S. Government Forest Service, Las Padres National Forest, Santa Barbara, Calif. Home: 17716 Duncan St., Reseda, Calif.

RILEY, EDWARD P., (m) Vice President, Accessories, Pneumatics & Hydraulic Products Divisions, Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, O. Home: 18929 Inglewood Dr., Rocky River, O.

RIMMER, PETER G., (a) Physical Tester, Res. & Devel. Dept., Atlantic Refining Co., 2700 Passyunk Ave., Philadelphia, Pa. Home: 1119 Cobbs St., Drexel Hill, Pa.

RINEHART, DEWEY, (m) Assist. Chief, Rocket Section, Bell Aircraft Corporation, Box 1, Buffalo, N. Y. Home: 16 Woodland Rd., Bedford, Mass.

RING, ELLIOT, (m) Group Engr., Propulsion Section, Aerodynamics Dept., Glenn L. Martin Co., Baltimore, Md. Home: 8418 Greenway Rd., Towson 4, Md.

RINGE, G. TRUXTON, (m) Sr. Group Engr.-Prelim. Design, Pilotless Aircraft Engng., Boeing Airplane Co., Box 3107, Seattle 14, Wash. Home: 1454—92nd Ave., Bellevue, Wash.

RINGLEB, FRIEDRICH O., (m) Staff Physicist, Engng., Naval Air Development and Material Center, Philadelphia, Pa. Home: 22 N.W. Jersey Ave., Woodbury Heights, N. J.

RIPLEY, HERBERT S., (m) Prop. Group Engr., Northrop Aircraft, Inc., Hawthorne, Calif. Home: 1 Chuckwagon Rd., Rolling Hills, Calif.

RIPPE, ROBERT S., (m) Mgr., Technical Relations, Explosives Division, Olin Mathieson Chemical Corp., E. Alton, Ill. Home: 8318 Pepperidge, Berkeley City 21, Mo.

RISING, SIMEON M., Jr., (m) Installation Engr., Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford 8, Conn. Home: 20 Wind Rd., East Hartford 8, Conn.

RISLEY, WILLIAM L., JR., (m) Field Test Engr., Florida Test Unit, Boeing Airplane Co., Box 820 Melbourne, Fla. Home: Box 335 Cocoa Beach, Fla.

RITCHEY, HAROLD W., (m) Technical Director, Rocket Divisions, Thiokol Chemical Corp., Trenton, N. J. Home: 901 Locust St., Huntsville, Ala.

RITCHEY, RANDOLPH, (m) Mgr. Aircraft & Missile Div., Consolidated Western Steel, A Division of U. S. Steel, 5700 S. Eastern, Los Angeles 3, Calif. Home: 237 Grand Ave., Long Beach 3, Calif.

RITTER, ARNOLD P., (m) Sr. Aerodynamics Engr., Convair, A Division of General Dynamics Corp., 3302 Pacific Hghwy, San Diego, Calif. Home: 4359 Elm St., San Diego 5, Calif.

RIVERS, JACK L., (a) Physicist, University of Cincinnati, Cincinnati 21, O. Home: 339 Delmar Place, Covington, Ky.

ROACH, ROBERT D., JR., (a) Rocket Design Engr., Rocket Division, Bell Aircraft Corporation, P. O. Box 1, Buffalo 5, N. Y. Home: 56 Heath St., Buffalo 14, N. Y.

ROBBA, WILLIAM A., (a) Head, Nuclear Power Group, Research Division, Raytheon Mfg. Co., Waltham 54, Mass. Home: 110 Gates St., Framingham, Mass.

ROBBINS, HUGH C., (m) Director, Robbins and Associates, 1735 West Florence Ave., Los Angeles 47, Calif. Home: 7112 So. Van Ness Ave., Los Angeles 47, Calif.

ROBERTS, CHARLES S., JR., (m) Proj. Engr., Redstone Div., Thiokol Chemical Corp., Huntsville, Ala. Home: 617 Bluefield Ave., Huntsville, Ala.

ROBERTS, EDWARD H., (m) Assoc. Engr.-Stress, Boeing Airplane Co., Wichita 1, Kan. Home: 4107 E. Kellogg, Wichita 1, Kan.

ROBERTS, ERNEST R., (m) Chief Engr., Solid Engine & Chemical Div., Aerojet-General Co., Azusa, Calif. Home: 223 S. Amelia, Glendora, Calif.

ROBERTS, FRED G., JR., (a) President, Traid Corporation, 4515 Sepulveda Blvd., Sherman Oaks, Calif. Home: 4429 Sherman Oaks Circle, Sherman Oaks, Calif.

ROBERTS, RICHARD W., (s) University of Rochester, P. O. Box 5226, River Campus Station, Rochester 20, N. Y. Home: 65 Harrison Ave., Kenmore 23, N. Y.

ROBERTS, ROBERT E., (m) Vice President, Fred T. Roberts & Co., Branchville Rd., Ridgefield, Conn. Home: "White Fences", Danbury Rd., Wilton, Conn.

ROBERTS, W. CAMERON, JR., (m) Proj. Engr., Chemist, Chemistry Dept., Atlantic Research Corp., 901 N. Columbus St., Alexandria, Va. Home: 210 W. Braddock Rd., Alexandria, Va.

ROBERTS, WILLIAM L., (m) Mid-West Rep., Government Div., RCA Service Co., Cherry Hill, Camden, N. J. Home: 102 Ft. Stanwix North, Rome, N. Y.

ROBERTSON, DONALD K., (m) Design Engr. 1, Structures Dept., Engng. Div., The Glenn L. Martin Company, Baltimore 3, Md. Home: 8727 Lackawanna Ave., Towson, Md.

ROBERTSON, DUANE E., (m) Instrumentation Leadman, Aerojet-General Corp., P. O. Box 1168, Sacramento, Calif. Home: 5748 Edmunds Way, Fair Oaks, Calif.

ROBERTSON, GEORGE M., (m) Chief Engr., Convair, A Division of General Dynamics Corp., Pomona, Calif. Home: 639 Orangewood, Covina, Calif.

ROBERTSON, ORAN F., (m) Section Mgr., Missile Engng. Dept., Technical Products Division, Allen B. Du Mont Laboratories, Inc., 11800 W. Olympic Blvd., Los Angeles 64, Calif. Home: 2476 S. Federal Ave., Los Angeles 64, Calif.

ROBILLARD, GEOFFREY, (m) Section Chief, Solid Rockets, JPL, California Inst. of Technology, 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 4393 Beulah Dr., La Canada, Calif.

ROBINETTE, CLIFFORD A., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 22071 Rausch, E. Detroit, Mich.

ROBINSON, JAMES M., (m) Devel. Chemist, Solid Engine & Chemical Div., Aerojet-General Corp., Azusa, Calif. Home: 809 Amador St., Claremont, Calif.

ROBINSON, JOHN O., (m) Res. Engr., Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 64 Erskine Dr., Pacific Palisades, Calif.

ROBINSON, KENDAL S., (m) General Supervisor, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 6271 Lubac Ave., E. Woodland Hills, Calif.

ROBINSON, WILLARD C., (m) Sr. Engr., Advanced Design Dept., Glenn L. Martin Co., Baltimore, Md. Home: 2807 Jomat Ave., Baltimore 14, Md.

ROBISON, GEORGE F., (m) Research Test Engr., Electrical & Electronics, Convair, A Division of General Dynamics Corp., Pacific Hgwy., Plant 2, Bldg. 51, San Diego, Calif. Home: 3620 Loma Way, San Diego 6, Calif.

ROCCO, THOMAS F., (m) Sr. Engr., Aerojet-General Corp., Box 1947, Sacramento, Calif. Home: 5167 Teichert Ave., Sacramento, Calif.

ROBLE, ARTHUR R., (m) Field Engr., Philco Corp., P. O. Box 37, Port Canaveral, Fla. Home: 22 Indian River Ct., Cocoa, Fla.

ROBOTTI, AURELIO C., (m) Mech. & Aero. Engr., TECO, Ltd, Torino, Italy. Home: 4, Via Assarotti, Torino, Italy.

ROCHLEN, AVA MICHAEL, (m) Director Public Relations, Douglas Aircraft Co., Santa Monica, Calif. Home: 509 N. Rockingham Ave., Los Angeles 49, Calif.

ROCKEFELLER, LAWRENCE S., (m) 30 Rockefeller Plaza, New York, N. Y. Home: 834 Fifth Ave., New York 21, N. Y.

RODEAN, HOWARD C., (m) Lead Propulsion Analyst, Propulsion Section, Engng., Dept., Chance Vought Aircraft, Incorporated, P. O. Box 5907, Dallas, Tex. Home: 1541 Connally Terrace, Arlington, Tex.

RODGERS, DONALD R., (m) Sales Engr., Washington Office, General Electric Co., 777 14th St., N.W., Washington 5, D. C. Home: 10118 Crestwood Rd., Kensington, Md.

RODGERS, OLIVER E., (m) Asst. General Mgr., Government & Industrial Products Division, Studebaker-Packard Corporation, 1580 E. Grand Blvd., Detroit 32, Mich. Home: 952 Wimbleton, Birmingham, Mich.

RODMAN, WILMOT L., (m) Proj. Engr., Boston Division, Allstates Design & Development Co., Inc., 830 Saratoga St., East Boston, Mass. Home: 580 W. 215th St., New York, N. Y.

RODRIGUEZ, CHARLES J., (m) Sr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 18142 Lemay St., Reseda, Calif.

ROENNAU, WILLIAM H., (m) Engr., Bureau of Aeronautics, Washington 25, D. C. Home: 3636 16th St. S.W., Washington 10, D. C.

ROGERS, DON E., (m) Devel. Engr., Aerojet-General Corporation, Azusa, Calif. Home: 1160 Hastings Ranch Dr., Pasadena 8, Calif.

ROGERS, JOHN D., JR., (m) Engr., Petroleum Chemicals Div., E. I. duPont de Nemours & Co., Inc., Wilmington 98, Delaware. Home: 1Marlton Rd., Woodstown, N. J.

ROGERS, JOHN M., (m) West Coast Representative, Reaction Motors, Inc., 1055 Norman Pl., Los Angeles 49, Calif.

ROGERS, LOREN E., (m) Electronic Engr., R.C.A. Missile Test Project, R.C.A. Service Co., Patrick AFB, Fla. Home: R.R. 1, Box 507, Melbourne, Fla.

ROGERS, ROBERT G., (m) Pres., Accessory Products Corp., 616 W. Whittier Blvd., Whittier, Calif. Home: 1440 Glencoe Dr., Arcadia, Calif.

ROGERS, ROBERT W., (m) Mech. Engr., Aerophysics Dept., North American Aviation, Inc., Lakewood Blvd., Downey, Calif. Home: 1832 W. Flower Ave., Fullerton, Calif.

ROGERS, WILLIAM L., (m) Assist. Gen. Mgr., Aerojet-General Corporation, 6352 N. Irwindale Ave., Azusa, Calif. Home: 1921 Braeburn Rd., Altadena, Calif.

ROGGAN, FRANCIS J., (m) Engng., Vice-President, Glar-Ban Corp., 2241 Elmwood Ave., Buffalo 23, N. Y. Home: 218 Rochelle Park, Tonawanda, N. Y.

ROHER, WILLIAM C., (m) Public Relations, Reaction Motors, Inc., Rockaway, N. J. Home: Box 52, Vernon, N. J.

ROHRBACH, GEORGE EDWARD, (s) University of Notre Dame, South Bend, Ind. Home: 315 Peachway St., South Bend 17, Ind.

ROHRER, WILLIAM G., (m) Field Rep., Northrop Aircraft, Inc., Hawthorne, Calif. Home: P. O. Box 16, Redlands, Calif.

ROMANCZUK, WALTER, (s) University of Buffalo, Buffalo, N. Y. Home: 225 Gorton St., Buffalo, N. Y.

ROMICK, DARRELL C., (m) Staff Engr., YTM-61B Project, Aerophysics Departments, Goodyear Aircraft Corporation, 1210 Massillon Rd., Akron 15, O. Home: 2619 Maplecrest Rd., Canton 9, O.

ROMICK, IRENE P., (a) Home: 2619 Maplecrest Rd., N.W., Canton, O.

RONEY, ROBERT K., (m) Head of Dept., Systems Analysis Dept., Hughes Aircraft Co., Culver City, Calif. Home: 6906 W. 84th Pl., Los Angeles 45, Calif.

ROOT, L. EUGENE, (m) Dir. of Development Planning, Lockheed Aircraft Corp., Burbank, Calif.

ROOT, ROBERT E., (m) Mgr., Administration, Res. & Devel. Lab., Rheem Mfg. Co., 9236 E. Hall Rd., Downey, Calif. Home: 1020 N. Richman Ave., Fullerton, Calif.

ROSE, EDWIN L., (m) Consulting Engr., P. O. Box 1389, Waterbury, Conn. Home: Middlebury, Conn.

ROSE, GERALD A., (a) San Francisco State College, San Francisco, Calif. Home: 1 Pinto Ave., San Francisco 27, Calif.

ROSE, ROBERT F., (m) Chief of Propulsion Section JPL, California Inst. of Tech., 4800 Oak Grove Dr., Pasadena, Calif. Home: 260 LeRoy, Arcadia, Calif.

ROSE, ROBERT H., 2nd, (a) Assist. Professor, Newark College of Engineering, 367 High St., Newark 2, N. J. Home: 23 Fuller Ave., Chatham, N. J.

ROSE, WILLIAM B., (m) Mgr., Development Dept., Westvaco Chlor-Alkali Div., Food Machinery & Chemical Corp., So. Charleston 3, W. Va.

ROSEN, GERALD H., (s) Princeton University, Princeton, N. J. Home: 668 Sewell Pl., Teaneck, N. J.

ROSEN, MILTON W., (m) Head, Rocket Development Branch, Naval Research Laboratory, Washington 25, D. C. Home: 2505 Fairlawn, Hillcrest Heights, Washington 21, D. C.

ROSENBAUM, MORTIMER, (m) Assist. Chief Engr., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 2104 Willow St., San Diego 6, Calif.

ROSENBERG, HANS K., (m) Mech. Eng., Prod. Mgr., Planet Products Corp., 6305 Warrick St., Cincinnati 27, O. Home: 5484 Eastwood Dr., Cincinnati 27, O.

ROSENBERGER, PAUL E., (a) Electroplater, Illinois Tool Works, Shakeproof, Inc., St. Charles Rd., Elgin, Ill. Home: 74 S. Alfred St., Elgin, Ill.

ROSENBLUM, MARTIN H., Research Engr., Preliminary Design Group, Rocketdyne, A Division of North American Aviation, Inc., Canoga Ave., Canoga Park, Calif. Home: 4940 Woodman Ave., Sherman Oaks, Calif.

ROSENFELD, HERMAN H., (m) Electrical Engr., 564-07 Rocketdyne, A Division of North American Aviation, Inc., 7100 Deering Ave., Canoga Park, Calif. Home: 2016 So. Beverly Glen Blvd., West Los Angeles 25, Calif.

ROSENGARTEN, JACOB, (s) The Cooper Union, Cooper Square, New York 3, N. Y. Home: 2070 20th Lane, Brooklyn 14, N. Y.

ROSENTHAL, WALTER L., (s) Res. Engr., North American Aviation, Inc., International Airport, Los Angeles, Calif. Home: 3609 Buena Vista, Glendale 8, Calif.

ROSLING, ROBERT T., (s) PFC, USMC, Marine Corps Air Station, Miami, Fla. Home: 1603 E. 50, Seattle 5, Wash.

ROSNER, DANIEL E., (s) Graduate College, Princeton Univ., Princeton, N. J. Home: 138 Elliot Place, New York 52, N. Y.

ROSS, ALFRED C., (m) District Sales Mgr., Carbide & Carbon Chemicals Co., 2770 Leonis Blvd., Los Angeles 58, Calif. Home: 1847 West Dr., San Marino, Calif.

ROSS, CHANDLER COLE, (f) Mgr., Liq. Engine Division, Aerojet-General Corporation, Azusa, Calif. Home: 1132 Pima, Covina, Calif.

ROSS, DOUGLAS H., (m) Director, Product Devel. Dept., Solvay Process Division, Allied Chemical & Dye Corporation, 61 Broadway, New York 6, N. Y. Home: 558 Lotus Rd., Ridgewood, N. J.

ROSS, PETER A., (s) Northwestern Tech. Inst., M. E. Dept., Evanston, Ill. Home: 124 Fourth St., Wilmette, Ill.

ROSS, T. MELVILLE, (m) Great London Rubber Company, England. Home: Spithurst House, Spithurst, Barcome Nr. Lewes, Sussex, England.

ROSS, STANLEY, (s) Harvard Univ., Cambridge, Mass. Home: 279 Hewes St., Brooklyn 11, N. Y.

ROSSEN, JOEL N., (m) Chemical Engr., Chemistry Div., Atlantic Research Corp., 901 N. Columbus St., Alexandria, Va. Home: 3211 Ravensworth Pl., Alexandria, Va.

ROSSMANN, THEODOR G., (m) Rocket Consultant, Rocket Div., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 423 Allenhurst Rd., Buffalo 23, N. Y.

ROSSONI, GIAMPIERO, (m) Instructor IBM Electronic Calculators (Methods), Department of Education, International Business Machines, 590 Madison Ave., New York, N. Y. Home: 610 West 116 St., New York 27, N. Y.

ROTH, DON C., (m) Engr., Cessna Aircraft Co., Prospect Plant, Wichita, Kan. Home: 1616 W. McArthur Rd., Wichita 13, Kan.

ROTH, LUDWIG, (m) Assist. Chief, Guided Missile Devel. Div., Redstone Arsenal, Huntsville, Ala. Home: 110 Central Ave., Huntsville, Ala.

ROTHENBERG, EDWARD A., (m) Aero. Res. Scientist, Rocket Branch, NACA, 21000 Brookpark Rd., Cleveland 11, O. Home: 177 Berkshire Rd., Avon Lake, O.

ROTHMAN, DAVID, (m) Engr.-Research., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 22125 Schoolcraft St., Canoga Park, Calif.

ROTHMAYER, NOEL Y., (m) Proj. Engr., Facilities Dept., Reaction Motors, Inc., Denville, N. J. Home: 307 W. Main St., Denville, N. J.

ROWE, KERNS E., (s) Indiana Technical College, Ft. Wayne, Ind. Home: 724 N. Zangs Blvd., Dallas 8, Tex.

RUBY, SAMUEL, (m) Chemical Consultant and Group Coordinator, Arkay Research Associates, 106 West First, Wichita 2, Kan. Home: 222 E. Elm St., Wichita 2, Kan.

RUCKERT, WILLIAM CARL, (m) Customer Relations Mgr., Denver Division, The Glenn L. Martin Co., P. O. Box 179, Denver 1, Colo.

RUCKS, EDWARD L., (m) Principal Engr., Solid Eng. Dept., Aerojet-General Corp., Irwindale Ave., Azusa, Calif. Home: 2870 E. Clarmeya, Pasadena 8, Calif.

RUDE, ARTHUR H., (m) Executive Vice President, Aerojet-General Corporation, Azusa, Calif. Home: 143 E. Sycamore, Arcadia, Calif.

RUDER, NATHAN S., (m) Rocket Propulsion Group Engr., Pilotless Aircraft Div., Boeing Airplane Co., Seattle, Wash. Home: 6133 Oakhurst Rd., Seattle, Wash.

RUDINGER, GEORGE, (m) Principal Physicist, Aerodynamic Research Dept., Cornell Aeronautical Lab., Inc., 4455 Genesee, Buffalo 21, N. Y. Home: 750 W. Delavan, Buffalo 22, N. Y.

RUDNEFF, YLYA A., (m) Engng. Dwg. Checker, McCormick Selph Associates, Hollister Airport, P.O. Box 6, Hollister, Calif. Home: 360 Hawthorne St., Monterey, Calif.

RUDOLPH, ARTHUR, (m) Tech. Advisor to Chief, Indust. Division, Redstone Arsenal, Huntsville, Ala. Home: Rt. 4, Box 296, Huntsville, Ala.

RUGGIERO, DANIEL J., (m) Technical Specialist, Knolls Atomic Power Lab., General Electric Co., Schenectady, N. Y. Home: Box 7, Jonesville, N. Y.

RUGHEIMER, ARTHUR H., JR., (m) President & Gen. Mgr., Chemical Engng., Engineering Specialties, Box 6471, Philadelphia 45, Pa.

RUPE, JACK H., (m) Sr. Res. Engr., JPL, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, Calif. Home: 8821 Hillroe Dr., Sunland, Calif.

RUPERT, SAMUEL J., (m) Vice President, Manufacturing, National Design & Research Corp., Box 34, Ann Arbor, Mich. Home: 1501 Shadford Rd., Ann Arbor, Mich.

RUSH, E. E., (m) Mech. Engr., Phillips Petroleum Co., McGregor, Tex. Home: 3609 N. 27th, Waco, Tex.

RUSSELL, CHARLES F., (a) President, Russell Associates, Inc., 165 Orinoco Dr., Brightwaters, N. Y. Home: 275 Lakeview Ave., W., Brightwaters, N. Y.

RUSSELL, C. R., (s) Test Engr., Bendix Products Division, Missile Section, Bendix Aviation Corp., 400 S. Beiger St., Mishawaka, Ind. Home: 420 S. 25th, S. Bond 15, Ind.

RUTKOWSKI, EUGENE V., (m) Rocket Design Engr., Code 4042, USNOTS, China Lake, Calif. Home: 308-A, Entwistle, China Lake, Calif.

RUTKOWSKI, JOSEPH, (m) Wayne University, Detroit, Mich: Home: Ridgemont Court, Dearborn 8, Mich.

RYDELEK, ROBERT F., (m) Home: P.O. Box 698, Dugway, Utah

RYPINSKI, ROBERT B., (m) Regional Mgr., Florida Regional Office, Ramo-Wooldridge Corp., Patrick AFB, Fla. Home: Gen. Del., Cocoa Beach, Fla.

S

SARRIS, GARY, (s) Purdue University, 535 Harrison St., West Lafayette, Ind. Home: 9319 Ballard Rd., Des Plaines, Il.

SABEL, ROBERT W., (m) Mgr., Nuclear Eng. and Research Div., Cook Electric Co., 2700 North Southport Ave., Chicago 14, Ill. Home: 757 Prairie Ave., Barrington, Ill.

SABOLIC, VICTOR V., (s) Case Institute of Technology, University Circle, Cleveland 3, O. Home: 1051 Addison Rd., Cleveland 3, O.

SACKMAN, JEROME L., (s) Guggenheim Fellow, Institute of Flight Structures, Columbia University, New York 27, N. Y. Home: 200-20 104th Ave., Hollis, N. Y.

SADLER, CARL L., (m) Mgr., Sundstrand Aviation, Div. of Sundstrand Machine Tool Co., 2421—11th St., Rockford, Ill. Home: 2416 Harlem Blvd., Rockford, Ill.

SAFFER, CHARLES M., JR., (m) Asst. Manager, National Northern, West Hanover, Mass. Home: 1385 Morrissey Blvd., Quincy, Mass.

SAGAN, CARL E., (s) University of Chicago, 1009 E. 59th St., Chicago 37, Ill. Home: 576 Bryant St., Rahway, N. J.

SAGE, CHARLES G., (m) President, ARDE Asociates, 14 William St., Newark 2, N. J. Home: 99 Vreeland Ave., Bergenfield, N. J.

SAIT, H. BERNARD, (m) Sales Mgr., American Reinforced Plastics Co., 650 So. Spring St., Los Angeles 14, Calif. Home: 488 W. 6th St., Claremont, Calif.

SALISBURY, HENRY M., (m) Des. Engr., Engng. Test Lab., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 2018 Cecelia Terrace, San Diego, Calif.

SALMASSY, OMAR K., (a) Principal Mech. Engr., Metallurgical Engng., Battele Institute, 505 King Ave., Columbus 1, O. Home: 1109 W. Sells Ave., Apt. B, Columbus 12, O.

SALTARELLI, EUGENE A., (m) Design Engr., Rocket Div., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 156 Freund St., Buffalo 15, N. Y.

SALTER, ROBERT M. J., (m) Head, Special Systems Department, Research Branch, Missile System Div., Lockheed Aircraft Corp., 7701 Woodley, Van Nuys, Calif. Home: 1514 Sorrento Dr., Pacific Palisades, Calif.

SALTER, TOM, (m) Vice President, Engng., Cessna Aircraft Co., Wichita, Kan. Home: 305 Morningside, Wichita, Kan.

SALVADOR, GALDINO, (m) Field Test Rep., Missile Operations, Chrysler Corp., P. O. Box 2628, Detroit 31, Mich. Home: 4440 Sepulveda, Apt. 11, Sherman Oaks, Calif.

SALVATO, VITO C., (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 92-18 176th St., Jamaica, N. Y.

SALWICK, WILLIAM V. (m), Engr., Research & Dev. Branch, Dept. of the Army, Los Angeles Ordnance District, 55 South Grand Ave., Pasadena, Calif. Home: 14319 Lanning Dr., Whittier, Calif.

SALZMAN, JEROME, (m) Assist. Proj. Engr., Development Staff, Reaction Motors, Inc., Denville, N. J. Home: 81 West Lake Shore Dr., White Meadow Lake, Rockaway, N. J.

SAMEK, MICHAEL J., (m) Home: 220 E. 73rd St., N. Y. 21, N. Y.

SAMMIS, EDWARD, (a) Sr. Engr., Indicating Systems Dept., Sperry Gyroscope Company, Division of Sperry Rand Corp., Great Neck, N. Y. Home: 146 Yale St., Roslyn Heights, N. Y.

SAMPOU, ANDRE P., (s) Chrysler Inst. of Engineering, Chrysler Corp., 13800 Oakland H.P. 3, Mich. Home: 20 Tyler, Highland Park 3, Mich.

SANCHINI, DOMINICK J., (m) North American Aviation, Inc., Santa Susana, Calif. Home: 5740 Cahill Ave., Tarzana, Calif.

SANDERS, WILLIAM C., (m) Res. Engr., Preliminary Design, Pilotless Aircraft Division, Boeing Airplane Co., Seattle, Wash. Home: 4516 10th Ave. So., Seattle 8, Wash.

SANDORFF, PAUL E., (m) Assoc. Prof., Massachusetts Institute of Tech., Cambridge 39, Mass. Home: Terrace Hall Ave., Burlington, Mass.

SANDS, NORMAN, (a) Res. Scientist, Supersonic Propulsion Division, NACA, 21000 Brookpark Rd., Cleveland, O. Home: 2196 West 93rd St., Cleveland, O.

SANDSTROM, R. J., (m) Vice President, Engng., Bell Aircraft Corporation, P. O. Box One, Buffalo 5, N. Y. Home: 172 Woodcrest Blvd., Kenmore 23, N. Y.

SARBACH, DONALD V., (m) Director of Res., Executive Offices, Hewitt-Robins, Inc., 666 Glenbrook Rd., Stamford, Conn. Home: Lord's Highway, RD #2, Weston, Conn.

SATO, KAZUHIKO, (m) Develop. Engr., Liquid Eng. Division, Aerojet-General Corp., 6352 N. Irwindale Ave., Azusa, Calif. Home: 2000 N. Arroyo Blvd., Pasadena, Calif.

SAUL, SOL, (m) Sr. Structures Engr., Structures Dept., Republic Aviation Corporation, Farmingdale, Long Island, N. Y. Home: 3 Theodore Dr., Bethpage, L. I., N. Y.

SAULS, JOHN F., (m) Mgr., Employee Relations Branch, Rocket Fuels Division, Phillips Petroleum Company, Box 548, McGregor, Tex. Home: 3909 Grim, Waco, Tex.

SAVAGE, ROBERT B., (a) Major, USAF, Holloman AFB, N. M. Home: Box 472, HAFB, N. M.

SAVARD, GUY, (a) Mgr.-Develop. & Engng. Dept., Canadian Liquid Air Co. Ltd., Room 505, 1111 Beaver Hall Hill, Montreal, Canada

SAWICKI, STEPHEN M., (m) "A" Process Engr., Quality Control Engng., Ford A.E.D., 7601 So. Cicero, Chicago, Ill. Home: 3902 N. Kenosha, Chicago 41, Ill.

SAWYER, R. TOM, (m) Mgr. of Research, Alco Products, Inc., Schenectady, N. Y. Home: HoHoKus, N. J.

SAWYER, ROLAND, (a) Special Advisor to the Board of Directors, Export-Import Bank, Washington 25, D. C. Home: Rt. 2, Box 505, McLean, Va.

SAWYER, WINSLOW A., (m) Engng. Physics, Arthur D. Little Inc., 30 Memorial Dr., Cambridge, Mass. Home: 64 Cedarcliff Rd., Braintree, Mass.

SAXTON, ROBERT G., (m) Assist. Sr. Engr., Systems Engng. Section, Eclipse-Pioneer Division, Bendix Aviation Corp., Teterboro, N. J. Home: 148 Terrace Ave., Hasbrouck Hts., N. J.

SCADRON, MARVIN, (m) Chief Engr., Aero. Research Instrument Co., 315 N. Aberdeen St., Chicago, Ill. Home: 8706 St. Louis, Skokie,, Ill.

SCALA, SINCLAIRE M., (s) Research Fellow, Aeronautical Engng. Dept., Princeton University, Princeton, N. J. Home: 407-B Devereux Ave., Princeton, N. J.

SCANLAN, JACK A., (m) Assist. Prof of Mech. Engng., Assoc. Dir. Engines Research Lab., Univ. of Texas, Austin, Tex. Home: Rt. 7, Box 55-D, Austin, Tex.

SCATTERGOOD, WILLIAM L., (a) Electronic Technician, Technical Operations, Pan American World Airways, Guided Missile Range Div., Patrick Air Force Base, Fla. Home: Coral Reefs, Rt. 1, Melbourne, Fla.

SCESA, STEVE, (a) Tech. Staff Member, Guided Missile Res. Division, The Ramo-Wooldridge Corporation, 8820 Bellanca Ave., Los Angeles 45, Calif. Home: 9609 Belford Ave., Los Angeles 45, Cal.

SCHAAFSMA, WILLIAM, (m) Chief Engr., Grand Central Rocket Co., P. O. Box 111, Redlands, Calif. Home: 1637 Henrietta St., Redlands, Calif.

SCHAAR, PETER L., (s) Home: 2629 Highview Terrace, Ft. Worth 9, Tex.

SCHACK, GROVER J., (a) Chief, Space Biophysics Section, Aero. Medical Field Lab., Holloman Air Force Base, N. M. Home: 2307 Alamogordo, N. M.

SCHAEFFER, C. F., (m) Tech. Director, Norden Lab. Div., Norden Ketay Corp., 121 Westmoreland Ave., White Plains, N. Y.

SCHAEFFER, EMILE J., (m) Chief Aero. Engr., O & R Department, U. S. Marine Corps Air Station, Cherry Point, N. C. Home: 1100 Arendell St., Morehead City, N. C.

SCHAEFER, EVERETT B., (m) Asst. Chief Engr., Canadair Ltd., P. O. Box 6037, Montreal, P. Q. Canada. Home: 3500 Rue De La Montagne, Montreal, P.Q. Canada.

SCHAEFER, HERBERT, (a) Project Engr., Kollsman Instrument Corp., 80-08 45th Ave., Elmhurst, N. Y. Home: 83-26 Victor Ave., Elmhurst, N. Y.

SCHAFF, ALFRED, JR., (m) Head, Field Service, Test & Field Service Division, Aerojet-General Corp., Azusa, Calif. Home: 1210 Wilson Dr., W. Covina, Calif.

SCHAFFER, ALLAN B., (s) Research Fellow, Gas Dynamics Lab., Northwestern University, Evanston, Ill. Home: 1645 Pfingsten Rd., Northbrook, Ill.

SHAFFER, RONALD L., (s) University of Wichita, Wichita, Kan. Home: 1749 N. Yale, Wichita, Kan.

SCHALLA, CLARENCE A., (m) Chief Proj. Engr., Res. & Devel., Pesco Products Division, Borg-Warner Corporation, 24700 North Miles Rd., Bedford, O. Home: 17107 Eldamere Ave., Cleveland 28, O.

SCHALOW, PETER S., (s) Georgia Inst. of Technology, Box 1567, Georgia Tech., Atlanta, Ga. Home: 2262 Park Pl., N.E., Atlanta, Ga.

SCHAPKER, RICHARD L., (m) Design Engr., Advanced Compressor Development Unit, General Electric Company, Cincinnati 15, O. Home: 2197 Shasta Pla., Cincinnati 11, O.

SCHARF, RHEINHARD W., (m) Chemical Engr., Rocket Fuels Div., Phillips Petroleum Co., Box 548, McGregor, Tex. Home: 3504 W. Brookview Dr., Waco, Tex.

SCHEELE, WESLEY W., (m) Mech. Engr., Missiles Power Plant Group, Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 9400 Varna Ave., Pacoima, Calif.

SCHEINMAN, ROBERT L., (a) Pres., Hettleman Corp., 1 Wall St., N. Y. C. Home: 1 Topland Rd., Hartsdale, N. Y.

SCHEUER, LEWIS J., (m) Project Supervisor, Ford Instrument Co., Div., Sperry Rand Corp., 31-10 Thompson Ave., Long Island City 1, N. Y. Home: 114 Bushwick Ave., Merrick, N. Y.

SCHIAVONE, D. C., (m) Engr., Bell Aircraft Corp., P.O. Box 1, Buffalo, N. Y. Home: 322 Mt. Vernon Road, Snyder, N. Y.

SCHIEWE, ROBERT M., (s) Purdue University, 462 Vine St., W. Lafayette, Ind. Home: 602 Richmond Ave., Richmond, Ind.

SCHIFF, RAYMOND M., (s) Field Service Engr., REAC, Reeves Inst. Corp., Roosevelt Field, Garden City, N. Y. Home: 356 Hericks Rd., Mineola, N. Y.

SCHILD, LYNDEL B., (s) N. Y. Central R. R., 466 Lexington Ave., N. Y., N. Y. Home: Greenfield, Ill.

SCHILLING, CLARENCE J., (m) Chief Engr., Air Products, Inc., P.O. Box 538, Allentown 1, Penna.

SCHILLING, GERHARD F., (m) Program Officer, United States National Committee for the International Geophysical Year, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington 25, D. C. Home: 6221-33rd St., N.W., Washington 15, D. C.

SCHILLING, MARTIN, (m) Chief, Proj. Management Staff, Res. & Dev. Div., Redstone Arsenal, Huntsville 5, Ala. Home: 912 Locust St., Huntsville 5, Ala.

SCHIMA, FRANCIS J., (s) St. Procopius College, Lisle, Ill. Home: 4035 Forest Ave., Brookfield, Ill.

SCHINDLER, WILLIAM R., (s) Univ. of Maryland, College Park, Md. Home: 12215 Dalewood, Dr., Wheaton, Md.

SCHLESINGER, ROBERT M., (s) Tufts University, Medford 53, Mass. Home: 34-19 86th St., Jackson Heights 72, N. Y.

SCHMADEBECK, LOUIS F., (m) Electronic Tech., Rocket Development Branch., Naval Research Laboratory, Washington 25, D. C. Home: 4802 Hamilton St., Hyattsville, Md.

SCHMADBECK, RICHARD L., (s) Home: 4802 Hamilton St., Hyattsville, Md.

SCHMIDT, E., (m) Consultant, General Electric Co., Schenectady, N. Y. Home: 9 N. Church, Schnectady, N. Y.

SCHMIDT, ERNEST E., (m) Assist. Engr., Applied Physics Lab., Johns Hopkins Univ., 8621 Georgia Ave., Silver Spring, Md. Home: 12409 Goodhill Rd., Wheaton, Md.

SCHMIDT, GERALD F., (a) Tech. Illustrator A., Beech Aircraft Corp., Wichita, Kan. Home: 1118½ Dayton St., Wichita, Kan.

SCHMIDT, HAROLD W., (m) Aero. Res. Fac. Engr., NACA, 21000 Brookpark Rd., Cleveland, O. Home: 940 Broadway East, Cuyahoga Falls, O.

SCHMIDT, LEO T., (m) Supervisor, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill. Home: 510 Bonnie Brae, River Forest, Ill.

SCHMIDT, RICHARD A., (m) Assist. Chief, Rocket Engine Test Lab., Edwards AFB, Calif. Home: 45002—16th St., W. Lancaster, Calif.

SCHMIED, WILLIAM F., JR., Staff Engr., Autonetics, A Division of North American Aviation, Inc., 9150 E. Imperial Hwy., Bellflower, Calif. Home: 13912 S. Piuma Ave., Norwalk, Calif.

SCHMITT, HEINZ E., (m) Div. Chief of the Eng. Div., Special Development Dept., Curtiss-Wright Corp., Brighton Rd., Clifton, N. J. Home: 243 Mulberry Pl., Ridgewood, N. J.

SCHNEIDER, ALLEN J., (s) Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn 1, N. Y. Home: 688 Carman Ave., Westbury, L. I., N. Y.

SCHNEIDER, MANNIE, (m) Power Plant Engr., Power Plant Staff, Republic Aviation Corp., Farmingdale, L. I., N. Y. Home: 163 Connecticut Ave., Massapequa, N. Y.

SCHNEIDER, RAYMOND J., (m) Cmdr. U. S. N., Head, Fire Control Branch, Armament Division, Rm. 1W17, BuAer, Washington 25, D. C. Home: 2489 Guilford Rd., Cleveland Heights 18, O.

SCHNEIDERMAN, GORDON R., (s) Academy of Aeronautics, LaGuardia Airport, Flushing, N. Y. Home: 1915 Billingsley Terr., Bronx 53, N. Y.

SCHNEIDERMAN, HERMAN, (m) Development Chem. Engr., Aerojet-General Corp., Azusa, Calif. Home: 8941 Greenwood, San Gabriel, Calif.

SCHNORR, FRED W., (s) Engng. Assist. General Electric Co., Cincinnati, O. Home: 1408 Fields Ertel Rd., Loveland, O.

SCHNUR, ALBERT P., (s) Academy of Aeronautics, La Guardia Airport, Flushing, N. Y. Home: 1540 Research Ave., Bronx, N. Y.

SCHORNSTEIN, ROBERT J., (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: 1123 W. Washington Blvd., Ft. Wayne, Ind.

SCHRAM, JACK C., (m) Mechanical Engr., Central Engng., Chrysler Corp., P. O. Box 2628, Detroit 31, Mich. Home: 59 Kensington, Pleasant Ridge, Mich.

SCHREIB, ROLLAND ROBERT, JR., (m) Rocket Sect., General Electric Co., Schenectady, N.Y. Home: 164 Milton Ave., Ballston Spa, N.Y.

SCHREIBER, CHARLES B., (a) Owner, Schreiber Bros., 202 Crockett St., Beaumont, Tex. Home: 2620 Hazel Ave., Beaumont, Tex.

SCHREIER, STEFAN, (s) Aero. Eng. Div., Princeton University, Princeton, N. J. Home: 104 Grayling Ave., Narberth, Pa.

SCHROEDER, CARL R., (m) Mgr. Metal Sales, Metal and Thermit Corp., 100 E. 42nd St., N. Y. 17, N. Y. Home: 27 Glenwood Dr., Short Hills, N. J.

SCHROEDER, RICHARD L., (a) Jr. Des. Engr., Missile Engng. Div., McDonnell Aircraft Corp., Box 516, St. Louis 3, Mo. Home: 9448 Baltimore, St. Louis 14, Mo.

SCHRODER, WILLIAM R., (s) Time & Motion Engr., Industrial Engng., Western Electric Co., South Kearny, N. J. Home: 318 Fourth St., Carlstadt, N. J.

SCHUETT, EGON H., (s) Assoc. Engr., Aerodynamics, The Glenn L. Martin Co., Baltimore, Md. Home: 118-01 Atlantic Ave., Richmond Hill 18, L. I., N. Y.

SCHUETTE, KARL, (m) Prof., Munich University. Home: Ortnitstra 15, Postbox 81, Munich 27, Germany.

SCHULER, ALBERT E., (m) Section Chief, Guided Missile Develop., Div., Redstone Arsenal, Huntsville, Ala. Home: 29 Lowell Dr., Huntsville, Ala.

SCHULTHEIS, FRANK, (m) Operations Engr., WSPG., EML, N. M. Home: 418 "D" WSPG, N. M.

SCHULTZ, FREDERICK E., (m) Supervisor, Component Devel., Rocket Engine Section, General Electric Co., Malta Test Station, Ballston Spa, N. Y. Home: RD #1, Ballston Lake, N. Y.

SCHULZE, WILLIAM H., (m) Mechanical Engr., Redstone Arsenal, Huntsville, Ala. Home: 804 Hermitage St., Huntsville, Ala.

SCHUMANN, WILLIAM A., (m) Field Engr., Aircraft Sales Dept., Allison Div., General Motors Corp., Indianapolis, Ind. Home: 64 E. Southport Rd., Indianapolis 27, Ind.

SCHUYLER, FRED, (s) Brooklyn Polytechnic Institute, Brooklyn, N. Y. Home: 557 Ave. Z., Brooklyn 23, N. Y.

SCHWAGER, WILLIAM P., (m) Mgr., Guided Missile Div., Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles, Calif. Home: 5211 Vista Hermosa St., Long Beach 15, Calif.

SCHURMAN, KURT J., (m) Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 3137 Altura Ave., La Crescenta, Calif.

SCHWANINGER, JOHN E., (s) Polytechnic Institute of Brooklyn. Home: 127-05 101 Ave., Richmond Hill 19, N. Y.

SCHWARTZ, EDWARD W., (m) Sr. Thermodynamics Engr., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 58 Tyrone St., San Diego 19, Calif.

SCOTT, CHARLES N., (m) Development Engr., Goodyear Aircraft Corp., 1210 Massilon Rd., Akron 15, O. Home: 5905 Stillson Pl., Youngstown 12, O.

SCOTT, JAMES H., (m) Supervisor, Engine Test Equipment Design, Engng. Dept., Orenda Engines Limited, Malton, Ontario, Canada. Home: 57 Grenview Blvd., N. Toronto 18, Ontario, Canada

SCOTT, JOHN E., JR., (m) Associate Professor of Aero. Engng., School of Engng., The University of Virginia, Charlottesville, Va. Home: 1533 Rugby Ave., Charlottesville, Va.

SCOTT, JUDSON F., (m) Chief, Proj. Engr., Kett Corp., 4526 Chickering Ave., Cincinnati 32, O. Home: 7416 Juler Ave., Madeira, O.

SCOTT, WILLIAM R., (a) Rocket Test Technician, Liquid Test Dept., Aerojet-General Corp., Sacramento, Calif. Home: 7 Rosier Way, Placerville, Calif.

SCURLOCK, ARCH C., (m) President and Treasurer, Atlantic Research Corporation, 901 North Columbus St., Alexandria, Va. Home: 3042 Cambridge Place, Washington, D. C.

SEABROOK, MILTON R., (m) Missile Test Engr., Field Operations, Convair, A Division of General Dynamics, Pomona, Calif. Home: 654 Winn Dr., Upland, Calif.

SEALE, WAYNE A., (s) Home: 8338 La Docena Lane, Rivera, Calif.

SEARLE, RICHARD F., (m) Research Engr., Rocketdyne, A Div. of North American Aviation, Inc., Canoga Park Calif. Home: 21926 Celes St., Woodland Hills, Calif.

SEARS, ROBERT E., (m) Assist. Head, Propulsion Dept., Weapons Systems Development Laboratories, Hughes Aircraft Company, Florence & Teale, Culver City, Calif. Home: 204 So. Plymouth Blvd., Los Angeles 4, Calif.

SEASHOLTZ, FRANK D., (s) Indiana Technical College, 223 E. Washington Blvd., Ft. Wayne, Ind. Home: 814 Clay St., Fort Wayne, Ind.

SEBOK, CESAR GILBERTO, (s) Home: Via Giancarlo Sismondi 4, Milano, Italy.

SEBOLD, R. C., (m) Vice Pres., Engng., Convair, A Div. of General Dynamics Corp., San Diego, Calif. Home: 715 La Canada, La Jolla, Calif.

SEFCHIK, FRANCIS J. J. (m) Res. Chemist, Res. & Devel. Labs., Sun Chemical Corp., East Rutherford, N. J. Home: 121 Hammond Ave., Passaic, N. J.

SEIFERT, HOWARD S., (m) Chief, Propulsion Analysis, Guided Missile Res. Div., Ramo-Wooldridge Corp., Los Angeles 45, Calif. Home: 238 Grand Pre Blvd. N., Playa del Ray, Calif.

SEILER, DAYTON A., (m) Commander, U. S. Army, BuAero, 1206 S. Santee St., Los Angeles 15, Calif. Home: 930 Crestview Dr., Pasadena 8, Calif.

SELLARS, JOHN R., (m) Assist. Prof. Aero. Engng., University of Michigan, Ann Arbor, Mich. Home: 1908 Arbor View, Ann Arbor, Mich.

SELLERS, JOHN P., JR., (m) Sr. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 21041 Runnymede, Canoga Park, Calif.

SELLERS, R. C., JR., (s) Major, USA, Dept. of Mechanics, USMA, West Point, N. Y.

SELVIDGE, HARNER, (m) Director, Special Products Development, Bendix Aviation Corp., 1104 Fisher Bldg., Detroit 2, Mich. Home: 3831 W. Maple Rd., Birmingham, Mich.

SEMENIUK, GEORGE H., (s) Indiana Technical College, 221 E. Washington, Ft. Wayne 2, Ind. Home: 518 Madison St., Ft. Wayne, Ind.

SENIOR, JOHN L., JR., (m) Mgr., Cluneboniff Farms, 22 Dan's Highway, New Canaan, Conn.

SENSENBAUGH, NORMAN D., (m) Res. Engr., Aerophysics Div., North American Aviation, Inc., Box 202, Chatsworth, Calif. Home: 11030 Babbitt Ave., Granada Hills, Calif.

SENSENEY, GEORGE TOWNER, (m) Vice Pres. - Engng., Rahm Instruments, Inc., 12 W. Broadway, N. Y. 17, N. Y. Home: 124 E. 85th St., New York, N. Y.

SERGEYEVSKY, ANDREJ B., (s) Stress Engr., Engng., Dept., AiResearch Aviation Service Company, 5907 W. Imperial Hwy., Los Angeles 45, Calif. Home: 1536 6th Ave., Los Angeles 19, Calif.

SERVANTY, LUCIEN, (m) Chief Engr., Societe Nationale de Constructions Aeronautiques du Sud-Ouest, 2, rue de Larnac, Courbevoie (Seine), France. Home: 15, due Theodore de Banville, Paris (XVe), France.

SETTERLUND, GORDON, (m) Associate Res. Engr., Boeing Airplane Co., Seattle, Wash. Home: 2457 S.W. 150, Seattle, Wash.

SETTLEMIRE, LARRY, (m) Production Mgr., Production Division, Grand Central Rocket Co., P. O. Box 111, Redlands, Calif. Home: 26 Sherril Lane, Redlands, Calif.

SEYMOUR, R., (m) Chief Engr., Instruments & Systems Div., Norden Ketay Corp., Wiley St., Milford, Conn.

SHAAR, CAMILLE M., JR., (m) Chief Project Engr., Bendix Products Div., Missiles, Bendix Aviation Corp., 400 S. Beiger St., Mishawaka, Ind. Home: 3104 Springbrook Dr., South Bend, Ind.

SHAFER, H. JEROME, (m) Sr. Lecturer, Dept. of Aero. Engng., Technician, Israel Inst. of Tech., Haifa, Israel.

SHAFER, JOHN I., (m) Staff Engr., JPL, Calif. Inst. of Tech., 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 1654 Amberwood Dr., So. Pasadena, Calif.

SHAFRAN, ALLEN J., (s) University of Buffalo, Buffalo, N. Y. Home: 3354 Broadmoor Apt. A, Columbus 13, O.

SHAMBAN, WM. S., (m) Gen. Mgr., Administrative Dept., W. S. Shamban & Co., 11617 W. Jefferson Blvd., Culver City, Calif. Home: 740 Lachman Lane, Culver City, Calif.

SHANLEY, EDWARD S., (m) Assist. Technical Director, Becco Chemical Division, Food Machinery & Chem. Corp., Station "B" Buffalo, N. Y. Home: 369 Southwood Dr., Buffalo 23, N. Y.

SHAPCOTT, RALPH L., (m) Mgr., Flowmeter Division, Fischer & Porter Company, County Line, Hatboro, Pa. Home: 785 Redwood Dr., Southhampton, Pa.

SHAPERO, ALBERT, (m) Res. Engr., Hughes Aircraft Co., Florence & Teale Sts., Culver City, Calif. Home: 1480 Glenville Dr., Los Angeles, Calif.

SHAPIRO, HAROLD, (s) Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 155-20 101st St., Howard Beach 14, N. Y.

SHATZ, BERNARD, (s) Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn 1, New York, N. Y. Home: 4408 Bedford Ave., Brooklyn 29, New York, N. Y.

SHAW, JOHN D., (m) President, SKC Research Associates, 445 5th Ave., Paterson 4, N. J. Home: 310 Totowa Rd., Totowa Boro, N. J.

SHAW, JOHN R., (m) Engr., Rocket Engine Section, General Electric Co., Bldg. 600, Cincinnati 15, O. Home: 8339 Marley St., Cincinnati, O.

SHAW, RICHARD PAUL, (s) National Science Foundation, Institute of Flight Structures, Columbia University, c/o Dept. of Civil Eng., Columbia Univ., N. Y. Home: 99-02—209 St., Queens Village 29, N. Y.

SHAWCROSS, WILLIAM E., (m) Department of Physics, University of North Carolina, Chapel Hill, N. C. Home: P. O. Box 1361, Chapel Hill, N. C.

SHAY, MICHAEL, (m) Major USA, 330th Bomb. Squad., P. O. Box 45, Castle AFB, Calif. Home: 1193 Hendricks St., Gary, Ind.

SHEA, JAMES H., (a) Colonel U. S. Air Force, Res. & Dev. Div., Pentagon, Wash. 25, D. C. Home: 1109 Trinity Dr., Alexandria, Va.

SHEETS, JACK H., (m) Works Manager, Propeller Div., Curtiss-Wright Corp., Caldwell, N. J. Home: 128 Hillside Ave., Verona, N. J.

SHEDLOWSKY, JAMES P., (s) University of Michigan, Ann Arbor, Mich. Home: 4909 Clintonville Rd., Pontiac, Mich.

SHELDAHL, LOUIS R., (m) Project Engr., WSPG, N. M. Home: 1849 Solano, Las Cruces, N. M.

SHELDON, ZACHARY D., (m) Propellants Research Specialist, General Electric Co., AGT Division, Bldg. 30, Cincinnati 15, O. Home: P. O. Box 196, Cincinnati 15, O.

SHELLEY, EDWIN F., (m) Chief Engr., Bulova Research & Development Labs., Inc., Bulova Park, Flushing 70, N. Y. Home: 14 Wood Place, New Rochelle, N. Y.

SHEPARD, HORACE A., (m) Vice President, Staff Division, Thompson Products, Inc., 23555 Euclid Avenue, Cleveland 17, O. Home: 2731 Shelley Rd., Shaker Heights 22, O.

SHERBURNE, RUSSELL K., (m) Chief Physicist, Physical Science Laboratory, New Mexico College of A & MA, Box 548, State College, N. M. Home: Box 946, State College, N. M.

SHERMAN, ARTHUR, (m) Sr. Project Engr., Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: 24-A Braun Pl., Clifton, N. J.

SHERMAN, HARVEY, (m) Structures Engr., Lockheed Missile Systems Division, 7707 Woodley Ave., Van Nuys, Calif. Home: 7739 Glencrest Drive, Burbank, Calif.

SHERMAN, ROBERT, (s) Captain, Ord. C., Guided Missile Development Division, U. S. Army, Redstone Arsenal, Huntsville, Ala. Home: 1410 E. Oakwood Ave., Huntsville, Ala.

SHESTA, JOHN, (m) Consultant, Reaction Motors, Inc., Denville, N. J. Home: Box 1136, Sparta, N. J.

SHEWCHUCK, D. D., (a) Liasion Engr. "A", Crosley-Bendix Div., Avco Mfg. Co., Vultee Blvd., Berry Field, Nashville, Tenn. Home: 3700 Lealand Lane, Nashville, Tenn.

SHIELDS, G. R., Aviation Sales Mgr., Axelson Manufacturing Company, 6160 S. Boyle Ave., Los Angeles 58, Calif. Home: 11257 Landale, North Hollywood, Calif.

SHIFFICK, WILLIAM, (a) Vice President, Operations & Control, Foley Bros. Dry Goods Co., 1100 Main St., Houston, Tex. Home: 5306 Evergreen, Bellaire, Tex.

SHINALY, FRANCIS J., (m) Res. Advisor, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia 37, Pa. Home: 4928 Duffield St., Philadelphia 24, Pa.

SHOGRON, IVAR L., (m) Power Plant Engr., Douglas Aircraft Co., Inc., Santa Monica, Calif.

SHONERD, DAVID E., (m) Proj. Engr., Aerophysics Development & Corp., Santa Monica, Calif. Home: 122 Ipswich St., Playa Del Rey, Calif.

SHOPPACH, CHARLES E., (m) Physicist, Ord. Electro Mech. Lab. WSPG, Las Cruces, N. M. Home: 5405 Olson Pl., El Paso, Tex.

SHORT, LESLIE B., (m) Technical Account Executive, Government Contracts, Corydon M. Johnson Co., Inc., Bethpage, L. I., N. Y. Home: 103 Ernest St., No. Massapequa, N. Y.

SHORT, WILLIAM P., (a) Military Products Div., IBM, Poughkeepsie, N. Y. Home: 78 Ridge Rd., Poughkeepsie, N. Y.

SHUEY, HENRY M., (m) Head, Ballistics Section, Rohm & Haas Company, Redstone Arsenal Research Division, Huntsville, Ala. Home: 113 Panorama Dr., Huntsville, Ala.

SHUFELT, CHARLES E., (s) Tech. Engr., Aircraft Nuclear Propulsion Department, General Electric Company, P. O. Box 132, Cincinnati 15, O. Home: Box 130, R.R. #2, Sharonville, O.

SHUMAN, ROBERT M., (m) Sr. Project Test Engr., Hughes Aircraft Co., P. O. Box 5555, Tucson, Ariz. Home: 5347 E. 20th Street, Tucson, Ariz.

SHUMAN, WILLIAM P., JR., (m) Lt. U. S. Navy, Nav. Ord. Fac., Navy 3923, Box 6, c/o FPO, San Francisco, Calif. Home: 11 Orchard St., New London, Conn.

SIBBIT, WILMER L., (a) Member-Tech. Staff, The Ramo-Wooldridge Corp., 8820 Bellanca Ave., Los Angeles 45, Calif. Home: 259 Pasco de Granada, Redondo Beach, Calif.

SIDES, JOHN H., (m) Rear Admiral, Comdr. Cruiser Div. Six., U. S. Navy, U. S. Atlantic Fleet, c/o FPO, New York. Home: 3011 N. Military Rd., Arlington, Va.

SIEGEL, BERTRAM, (s) Home: 1275 Nelson Ave., Bronx 52, N. Y.

SIFF, WALTER C., (m) Quality Control Engr., Aerojet-General Corp., Azusa, Calif. Home: 250 No. Oakland, Pasadena, Calif.

SIGLEY, DANIEL T., (m) Associate Director for Guided Missiles, General Engineering Laboratories, American Machine & Foundry Company, 11 Bruce Pl., Greenwich, Conn. Home: 30 Lakeview Dr., Stamford, Conn.

SIGNOR, RICHARD W., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 209 N. State St., Ann Arbor, Mich.

SIKORSKY, IGOR I., (m) Engng. Mgr., Sikorsky Aircraft Division, United Aircraft Corporation, South Ave., Bridgeport, Conn.

SILVA, RICHARD W., (s) University of California, 2315 Dwight Way, Berkeley 4, Calif. Home: 1785 Rex St., San Mateo, Calif.

SILVER, FRANCIS 5th, (m) Weight Analyst, Fairchild Engine & Airplane Corp., Hagerstown, Md. Home: 501 S. Queen St., Martinsburg, W. Va.

SILVERN, DAVID H., (m) Sr. Proj. Engr., Adv. Eng. Section, Gas Turbine Department, Continental Aviation & Engineering Corp., 12700 Kercheval, Detroit, Mich. Home: 16230 Indiana, Detroit 21, Mich.

SILVERSTEIN, ABE, (m) Associate Director, Lewis Flight Propulsion Laboratory, NACA, 21000 Brookpark Rd., Cleveland 11, O. Home: 4810 West 211th St., Cleveland 26, O.

SILVEY, MAYO S., (m) Mgr. - Marketing, Defense & Industrial Products, Alco Products, Incorporated, Schenectady, N. Y. Home: 1650 Providence Ave., Schenectady, N. Y.

SIMAS, VICTOR R., (m) Electronic Scientist, Vanguard Division, Naval Research Labs., Washington 25, D. C. Home: 310 Terrell Ave., Washington 21, D. C.

SIMMONS, STANLEY H., (a) Staff Member, Nuclear Propulsion Div., Los Alamos Scientific Lab., P. O. Box 1663, Los Alamos, N. M. Home: 2170 46th St., Los Alamos, N. M.

SIMONS, DAVID G., (m) Chief of Space, Biology Br., Aero. Med. Field Lab., Box 423, Holloman A. D. Center, N. M. Home: 406 Lovers Lane, Alamogordo, N. M.

SIMONS, STEVENS, (s) Brooklyn Polytechnic Inst., Brooklyn, N. Y. Home: Star Route, Kelsey, N. Y.

SIMS, EUGENE C., (m) Flight Test Engr., Flight Test Model 7, Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 3439 Sparling Ave., San Diego 15, Calif.

SIMS, JOSEPH L., (m) Aerodynamics Development Engr., Ordnance Missile Labs., Redstone Arsenal, Huntsville, Ala. Home: 133 Crestline Rd., Huntsville, Ala.

SINCLAIR, LEE S., JR., (m) Principal Engr., Ord. Rocket Dept., Aerojet-General Corp., Azusa, Calif. Home: 425 W. Virginia Ave., Glendora, Calif.

SINDELAR, E. C., (m) Proj. Engr., Texas Metal and Manufacturing Co., Inc., 6114 Forest Park Rd., Dallas, Tex.

SING, DANIEL Y., (m) Proj. Structures Engr., Bell Aircraft Corp., Buffalo, N. Y. Home: 151 Hampton Parkway, Kenmore, N. Y.

SING, PAUL Y., (m) Rocket Design Engr., Rocket Section, Bell Aircraft Corporation, P. O. Box 1, Buffalo 5, N. Y. Home: 3206 Stony Point Rd., Grand Island, N. Y.

SINGER, JOEL I., (m) Precision Assembler, Hughes Aircraft Co., Tucson, Ariz. Home: 959 Calle Lerdo, Tucson 2, Ariz.

SINGER, S. F., (m) Assoc. Prof. of Physics, University of Maryland, College Park, Md. Home: 2B Ridge Rd., Greenbelt, Md.

SINNETTE, JOHN T., JR., (m) Consultant Physicist & Research Scientist, Research Division, U. S. Naval Ordnance Test Station, 3202 E. Foothill Blvd., Pasadena 8, Calif. Home: 2251 Spaulding Pl., Altadena, Calif.

SISCO, WINBERN O., JR., (m) Deputy Chief, Ammunition Division, Redstone Arsenal, Huntsville, Ala. Home: 764 Big Cove Rd., Huntsville, Ala.

SITTON, LOUIS J., (m) Eng. Res., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 20218 Sherman Way, Canoga Park, Calif.

SKEIST, S. MERRILL, (m) Home: 64, The Serpentine, Roslyn Estates, Long Island, N. Y.

SKINNER, LESLIE A., (m) Ordnance Engr., Home: 8 Stuyvesant Rd., Asheville, N. C.

SKINNER, WILLIAM J., (m) Deputy Chief, Torpedo Div., U. S. Naval Underwater Ord. Sta., Newport, R. I. Home: 16003 Cleviden Rd., Cleveland 12, O.

SKOOG, RALPH E., (s) Home: 432 South East, Crown Point, Ind.

SKOWRON, MARTIN L., (m) Designer, Designers for Industry, Inc., 5543 North 5th St., Philadelphia 20, Pa. Home: 1521 E. Meyamensing Ave., Philadelphia 47, Pa.

SKROB, RICHARD S., (s) Assist. to the Product Engr., Research and Development Lab., Rheem Mfg. Co., Downey, Calif., 9236 E. Hall Rd., Downey, Calif. Home: 10406 Orange Ave., So. Gate, Calif.

SLADE, A. C., (f) Secretary, American Rocket Society, 500 5th Ave., New York 36, N. Y. Home: 3 Elizabeth Court, Maywood, N. J.

SLAUGHTER, JOHN C., (s) Creighton University, 25th & California Sts., Omaha, Nebr. Home: 1412 South 48th St., Omaha, 6, Nebr.

SLAUGHTER, LOMIS, JR., (m) Vice Pres. — Chief Engr., Anderson Greenwood & Co., 1400 N. Rice, Bellaire (Houston), Tex. Home: 2338 Bolsover, Houston 5, Tex.

SLAUGHTER, WILLIS R., (m) Vice President, Contracts, W. L. Maxson Corp., 460 W. 34th St., New York 1, N. Y. Home: 3515 Henry Hudson Pky., New York 63, N. Y.

SLAWSON, KENNETH, (m) Vice President, Ford Instrument Company, Division of Sperry Rand Corporation, 31-10 Thomson Ave., Long Island City 1, N. Y. Home: 20 Sutton Pl. So., New York 22, N. Y.

SLAWECKI, LEON M., (s) Home: 3421 N. 3rd St., Phila. 40, Pa.

SLIWINSKI, MITCHELL S., (m) Sr. Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 2073 N. Ivar, Hollywood 28, Calif.

SLOOP, JOHN L., (f) Chief, Rocket Branch, NACA Lewis Flight Propulsion Lab., 21000 Brookpark Rd., Cleveland 11, 0. Home: 4607 W. 210th St., Fairview Park 26, O.

SLOTTMAN, GEORGE V., (m) Vice President, Research and Engineering, Air Reduction Co., Inc., 150 E. 42nd St., New York 17, N. Y. Home: One University Place, New York 3, N. Y.

SMALL, ALVIN L., (a) 559th F.A. Missile Battalion (CPL), APO 185, c/o P.M., New York. Home: c/o Mrs. R. W. McLendon, Beaumont, Miss.

SMALLBERG, MERLE, (m) Proj. Engr., Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 6556 Randi Ave., Canoga Park, Calif.

SMEDFJELD, JOHN B., (s) Flutter and Vibration Engr., Research Department, Grumman Aircraft Engng. Corp., Bethpage, Long Island, N. Y. Home: 531 53rd St., Brooklyn 20, N. Y.

SMILG, DAVID, (a) Designer, Engng. Dept., Crosley Research Laboratory, 257 Crescent St., Waltham, Mass. 81 Greenwood St., Dorchester, Mass.

SMITH, ALDEN W., (a) Sales Engr., Philco Corp., G. & I., Div., 4700 Wissahickon Ave., Philadelphia 44, Pa. Home: 218 Christopher St., Montclair, N. J.

SMITH, ALMONTIE C., (m) Process Co-ordinator-Special, Pilotless Aircraft Div., Boeing Airplane Co., P. O. Box 3107, Seattle Wash. Home: 2217 30th Ave. So., Seattle 44, Wash.

SMITH, A. M. O., (m) Supv. Des. Res., Douglas Aircraft Co., El Segundo, Calif. Home: 2245 Ashbourne Dr., San Marino 9, Calif.

SMITH, BERNARD, (m) U. S. NOTS, Code 42, China Lake, Calif. Home: 604-2 Essex Circle, China Lake, Calif.

SMITH, BONNE, (a) Home: 1421 Arch St., Philadelphia 2, Pa.

SMITH, BOYD L., (a) Sr. Designer-Structures, Product Design Dept. 466, Goodyear Aircraft Corporation, Akron, O. Home: 2854 Oakwood Dr., Cuyahoga Falls, O.

SMITH, CHARLES H., (s) Northwestern Univ., Technological Institute, Evanston, Ill. Home: 5408 Wellington Ave., Chicago 41, Ill.

SMITH, CHARLES P., JR., (m) Electronic Scientist, Naval Research Lab., Wash., D. C. Home: 149 Danbury St., S.W., Wash. 25, D. C.

SMITH, CHESTER W., (m) Technical Adviser, Aircraft Gas Turbine Div., General Electric Co., 920 Western Ave., Lynn 3, Mass. Home: 2 Rogers Ave., Lynn, Mass.

SMITH, FRANK C., (m) Project Stress Engr., Thieblot Aircraft Co., Hampden Lane, Bethesda, Md. Home: 10004 Wildwood Rd., Kensington, Md.

SMITH, GEORGE HARVEY, (m) Research Asociate, Flame Research, Linde Air Products Co.., E. Park & Woodland Ave., Tonawanda 17, N. Y. Home: 96 Leicester Rd., Kenmore 17, N. Y.

SMITH, HENRY A., (m) Sr. Engr., Ordnance Design, Aircraft Armaments, Inc., P. O. Box 126, Cockeysville, Md. Home: 1667 Hardwick Rd., Towson 4, Md.

SMITH, JOHN J., (s) Academy of Aeronautics, LaGuardia Airport, New York, N. Y. Home: 34-32—44th St., Long Island City 1, N. Y.

SMITH, KENNETH W., (m) Chief Engr., Young Development Laboratories, Inc., Rocky Hill, N. J. Home: 269 Harrison St., Princeton, N. J.

SMITH, KIRSEY O., (a) Aero. Engr. Aerodynamics, North American Aviation, Inc., E. Fifth Ave., Columbus, O. Home: 406 S. James Rd., Columbus 13, O.

SMITH, LEVERING, (m) Captain, USN, U. S. Naval Ordnance, Washington, D. C. Home: 1012 Madison, Arlington, Va.

SMITH, MAURICE H., (m) Assist. to the Director, The James Forrestal Research Center, Princeton University, Princeton, N. J. Home: Brunswick Pike, Princeton R.D. 3, N. J.

SMITH, RICHARD D., (a) Lt., USAF, Wright Air Development Center, Area "B", Box 7318, Wright-Patterson AFB, Ohio.

SMITH, RICHARD D., (a) Res. Assistant, School of Mech. Engng, Purdue University, W. Lafayette, Ind. Home: 926½ Logan St., Lafayette, Ind.

SMITH, ROBERT J., JR., (m) Design Study Eng., Texas Metal and Manufacturing Co., Inc., 6114 Forest Park Rd., Dallas Tex.

SMITH, ROBERT L., (s) Instructor, Army Guided Missile School, A Btry., 3rd GM, Bn, 2nd GM Gp (ssm), Ft. Bliss, Tex. Home: 411 Buffalo St., Mannington, W. Va.

SMITH, ROLAND W., (s) Boston University, 231-A Chestnut Hill Ave., Brighton 35, Mass.

SMITH, SANFORD R., (m) Engng. Reports & Computations Supervisor, Dept. N. 4520, Ford Motor Company, 7401 S. Cicero Ave., Chicago 29, Ill. Home: P. O. Box No. 746, Oak Lawn, Ill.

SMITH, VERL O., (m) Chief, Missile Test Facility, Engng. Division, Northrop Aircraft Inc., OMU Box 338, Patrick Air Force Base, Fla. Home: 1343 Whitmire Dr., Eau Gallie, Fla.

SMITH, WILLIAM F. C., (m) Electronic Scientist, Instrumentation Br., WSPG, Box 53, State College, N. M.

SMITH, WILLIAM M., (f) Chief Rocket Engng., Rocket Eng. Department, Bell Aircraft Corp., P. O. Box #1, Buffalo 5, N. Y. Home: 100 Kenton Rd., Kenmore 17, N. Y.

SMITH, WILLIAM M., (m) V. P. & Chief Engr., Accessory Products Corp., 616 W. Whittier Blvd., Whittier, Calif.

SMITH, WILLIAM W., (m) Engr.—Electronic & Field, H. A. Wagner Company, 14707 Keswick, Van Nuys, Calif. Home: 1218 Wycliff Ave., San Pedro, Calif.

SMYERS, WILLIAM H., JR., (s) Proj. Engr., Cleveland Resarch & Dev. Center, Aero. Supply Mfg. Co., Inc., 15614 Detroit Ave., Cleveland 7, O. Home: 11839 Edgewater Dr., Cleveland 7, O.

SNELLING, KEN E., (m) Customer Relations Director, Govt. Prod. Div., Rheem Mfg. Co., 9236 E. Hall Rd., Downey, Calif. Home: 8738 Edmond Dr., Rosemead, Calif.

SNODGRASS, RICHARD B., (m) Physicist, Project Vanguard, Naval Research Lab., Code 4125, Washington 25, D. C. Home: 2104 "O" St., N.W., Washington 7, D. C.

SNOW, FRANK J., (m) Proj. Engr., Engng., Control Instrument Co., 67-35 St., Brooklyn 32, N. Y. Home: 1466 Baldwin Blvd., Bay Shore, L. I., N. Y.

SNOWDEN, EARL W., (m) Stress Analyst, Engng. Department, The Frye Corporation, 617 Texas St., Ft. Worth, Tex. Home: 601 Sweetbrier, Arlington, Tex.

SOGORKA, JOHN J., JR., (m) Design Engr., Liq. Eng. Div., Aerojet-General Corp., Azusa, Calif. Home: 1475 Casa Grande St., Pasadena 7, Calif.

SOMERS, JOHN C., (m) President, Industrial Products Engng. Co., 26-40 Jackson Ave., Long Island City, N. Y. Home: 31-48 78th St., Jackson Heights, N. Y.

SONTHEIMER, CARL G., (a) Executive Vice-President, Director of Engng., CGS Laboratories, Inc., 391 Ludlow St., Stamford, Conn. Home: 350 Flax Hill Rd., S. Norwalk, Conn.

SOPP, GEORGE A., (a) Res. Engr., System Hydro. & Thermodynamics, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 21225 San Miguel St., Woodland Hills, Calif.

SOREM, STANLEY S., (m) Res. Supervisor, Fuels & Engine Lubricants Dep., Shell Development Co., Emeryville 8, Calif. Home: 22 Snowberry La., Orinda, Calif.

SOSNOSKI, HARRY A., (m) Director of Operations, Aviation Division, Olin Mathieson Chemical Corporation, 1700 "K" St., Washington 6, D. C. Home: 2113 "S" St., N.W., Washington 8, D. C.

SOTERIOU, JAMES G., (m) Sr. Design Engr., Power Plant, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 15037 Saticoy St., Van Nuys, Calif.

SOUCY, WILLIAM A., (m) W. A. Soucy Scientific Res., 2032 Metcalfe St., Montreal 2, Canada.

SPAHR, DAVID P., (s) Laboratory Tech., Axle & Transmission Dept., International Harvester, Meyer Rd., Ft. Wayne, Ind. Home: 4511 So. Colonial Ave., Ft. Wayne, Ind.

SPARROW, CHESTER D., (m) Flight Test Engr., Boeing Airplane Company, 7755 East Marginal Way, Seattle 14, Wash. Home: 3218 So. 154th St., Seattle 88, Wash.

SPEAKMAN, EDWIN A., (m) Vice President and General Manager, Fairchild Guided Missiles Division, Fairchild Engine & Airplane Corp., Wyandanch, L. I., N. Y. Home: 12 Northfield Lane, Westbury, N. Y.

SPENCER, GEORGE T., (m) Sales Manager, Electro Mechanical Products Co., 32700 Ford Rd., Garden City, Mich.

SPEYER, ALFRED, (m) Dev. Engr., Aerojet-General Corp., Azusa, Calif. Home: 1512 Delford Ave., Duarte, Calif.

SPIEGLER, STUART D., (s) New York University, Rm. 202 Loew Hall, University Heights, Bronx, N. Y.

SPIELMAN, STERLING C., (m) Dir. Electronic Eng., Gov't. & Industrial Div., Philco Corp., 4700 Wissahickon Ave., Philadelphia, Pa.

SPIES, ROBERT, (m) Development Engr., Aerojet-General Corp. ,Azusa, Calif. Home: 970 Crestview Dr., Pasadena, Calif.

SPILHAUS, ATHELSTAN F., (m) Dean, Institute of Technology, University of Minnesota, Minneapolis 14, Minn. Home: 40 Crocus Place, St. Paul 2, Minn.

SPILLANE, LEO J., (m) Mgr. Organic Chem. Research, Lion Oil Co., El Dorado, Ark. Home: 1220 West Block, El Dorado, Ark.

SPITALNY, MAX, (a) S., Technical Writer, W. L. Maxson Corp., 460 W. 34th St., New York 1, N. Y. Home: 121 W. 72nd St., New York 23, N. Y.

SPOEHEL, EDWIN H., (a) Design Engr., Missile Development Division, North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 3600 Cedar Ave., Lynwood, Calif.

SPONTAK, JOSEPH, (m) Electric Engr., ERA Digital Computer, Westinghouse Elec. Corp., P. O. Box 1028, Melbourne, Fla. Home: 1121 E. South Ave., Patrick AFB, Fla.

SPOON, GEORGE E., (m) Tech. Aide to Chief of Gen. Engng. Labs., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 610-A Allenhurst Rd., Buffalo 23, N. Y.

SPRATTLING, WILLIS, JR., (m) Design Specialist, Pilotless Aircraft Division, Boeing Airplane Co., Seattle 14, Wash. Home: 11258 Glendale Way, Seattle 88, Wash.

SPRAY, ELLIS L., (m) Executive Vice President, The W. L. Maxson Corporation, 460 W. 34th St., New York 1, N. Y. Home: 8 Godwin Dr., Wyckoff, N. J.

SPRENGER, DAVID F., (m) Chief Production Engr., Solid Rocket Plant, Aerojet-General Corporation, Box 1168, Sacramento, Calif. Home: 3128 Bertis Dr., Sacramento 21, Calif.

SPRINGSTEAD, ELLIOT T., (s) Components Test Engr., Rocket Division, Bell Aircraft Corporation, P. O. Box 1, Buffalo 5, N. Y. Home: 35 Wiliamsburg Rd., Pittsford, N. Y.

SQUIERS, JOHN C., (m) Staff Engr., Continental Aviation & Engr. Corp., 12700 Kercheval, Detroit, Mich. Home: 1042 Anita, Grosse Pointe 36, Mich.

STACEY, JOSEPH M., (m) Lincoln Laboratory, Lexington, Mass. Home: 49 Thoreau St., Concord, Mass.

STACH, OTTO R., (m) General Manager, Borolite Corp., Perth Amboy, N. J. Home: 24 Hillside Pl., Fair Haven, N. J.

STAMPLEY, "O" "K", JR., (m) Flight Test Engr., Dept. of Commerce, Civil Aeronautics Administration, 5651 W. Manchester Ave., Los Angeles 45, Calif. Home: 7506 Andasol Ave., Van Nuys, Calif.

STAMY, JAMES L., (m) Assistant to the Chief, Launching & Handling Equipment Lab., Army Ballistic Missile Agency, Redstone Arsenal, Huntsville, Ala. Home: 504 Carmelian Dr., Huntsville, Ala.

STANKEVICS, JANIS O. A., (s) University of Minnesota, 1218 6th St., S.E., Minneapolis 14, Minn.

STANLEY, NORMAN F., (m) Research Dir., Algin Corp. of America, P. O. Box 895, Rockland, Me.

STANLY, ALBERT L., (m) Administrative Manager, Engng. Division, Associated Missile Products Corp., 2709 Gavey Ave., Pomona, Cal. Home: 848 S. Hollenbeck Ave., West Covina, Calif.

STANONIS, ALPHONSO F., (m) Res. Engr., Research Dept., Bell and Howell Co., 7100 N. McCormick Rd., Chicago 45, Ill. Home: 2035 Birch St., Des Plaines, Ill.

STANTON, EARL G., (m) Mgr., Photographic-Motion Picture Dept., Bell Aircraft Corp., Box One, Buffalo 5, N. Y. Home: 100 Fairfield Ave., Kenmore 23, N. Y.

STAPP, JOHN PAUL, (m) Lt. Colonel, USAF(MC), Aero. Medical Field Laboratory, Hq. Sq. Sec., Hq. HADC, Holloman Air Force Base, N. M. Home: P. O. Box 134, Holloman AFB, N. M.

STARK, JOHN K., (m) Develop. Engr., Test and Field Service Division, Aerojet-General Corp., 6352 Irwindale Ave., Azusa, Calif. Home: 17803 Verness St., Covina, Calif.

STARK, LLOYD W., (m) Assist. to Dir. Redstone Grad. Inst., Redstone Arsenal, Huntsville, Ala. Home: 424 Randolph, Huntsville, Ala.

STARKWEATHER, FREDERICK T., (m) Mathematician, Flight Determination Lab., Data Reduction Br., WSPG, N. M. Home: Billeting Office, Box 111, WSPG, N. M.

STARRETT, DANIEL, (a) Design Engineer A, Liquid Rocket Plant, Aerojet-General Corp., Sacramento, Calif. Home: 2545 Fulton Ave., Apt. 55, Sacramento 21, Calif.

STARRH, GERALD L., (m) Sr. Engr., Test and Field Service Division, Aerojet-General Corporation, 6352 N. Irwindale, Azusa, Calif. Home: 403 E. Myrtle Ave., Glendora, Calif.

STASSINOS, JAMES W., (m) Research Engr., Development, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8763 Tilden Ave., Van Nuys, Calif.

STEARNS, RUSSELL C., (a) Design Draftsman, Applied Physics Laboratory, Johns Hopkins University, 8621 Georgia Ave., Silver Spring, Md. Home: 5712 Wainwright Ave., Rockville, Md.

STEARNS, WILLIAM GORDON J., (m) Commander, U.S. Navy, Naval War College, Newport, R. I. Home: 24-B Jefferson, Ft. Adams, Newport, R. I.

STECHER LEWIS J., JR., (m) Executive, Operations Officer, United States Naval Ordnance Missile Test Facility, 743 W.S.P.G., N. M. Home: c/o Capt. L. J. Stecher, 4485 Calavo Dr., La Mesa, Calif.

STECHMAN, CHARLES W., (m) Des. Engr., Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 8944 Rosewood Dr., Sacramento, Calif.

STEELE, ALAN E., (m) Analytical Engr., Engng., Pratt & Whitney Aircraft, Engineering Bldg., East Hartford, Conn. Home: 24 Seventh St., New Britain, Conn.

STEELE, THEODORE K., (a) Staff Engr., Research, Bulova Res. & Dev. Labs., Inc., 62-10 Woodside Ave., Woodside 77, N. Y. Home: 219-02—74th Ave., Bayside 64, N. Y.

STEHLING, KURT R., (m) Rocket Section Head, Vehicles Branch, Vanguard, Naval Research Laboratory, Washington 25, D. C. Home: 9329 Riggs Rd., W. Hyattsville, Md.

STEINBERG, FREDERICK, (m) Mathematician, Thrust Chamber Dept., Aerojet-General Corporation, Liquid Rocket Plant, P. O. Box 1947, Sacramento, Calif. Home: 1821 "O" St., Sacramento 14, Calif.

STEINHOFF, ERNST A., (m) Chief Tech. Analysis Div., Holloman Air Development Center, Holloman AFB, N. M. Home: P. O. Box 814, Alamogordo, N. M.

STELL, ROBERT L., (m) Major, USAF, Guided Missile Proj. Officer, Patrick AFB, Fla. Home: 1608 E. Hearon St., Paris, Tex.

STEMBER, JEROME A., (s) Polytechnic Institute of Brooklyn, Brooklyn, N. Y. Home: 909 East 5th St., Brooklyn 30, N. Y.

STENGEL, MELVIN G., (m) Project Co-ordinator, Rocket Engng. Dept., Bell Aircraft Corporation, P. O. Box One, Buffalo 5, N. Y. Home: 254 Humboldt Parkway, Buffalo 14, N. Y.

STEPHENS, ARNOLD H., (m) Applications Engr., Grove Controls, Inc., 1930 W. Olympic, Los Angeles, Calif. Home: 7401 Westlawn Ave., Los Angeles 45, Calif.

STEPHENS, FLOYD R., JR., (m) Field Engr., Guided Missile Division, Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles, Calif. Home: 504 Tunlaw Rd., Huntsville, Ala.

STEPHENS, HENRY C., (m) Sr. Design Engr., Turbo Pumps, Rocketdyne, A Division of North American Aviation, Inc., Canoga Ave., Canoga Park, Calif. Home: 1412 Buena Vista, San Clemente, Calif.

STEPHENSON, FRANK W., JR., (m) Rocket Eng. Engr., Rocket Eng. Design Group, Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 49 West Park Rd., Grand Island, N. Y.

STEPHEY, HARRY M., (m) Government Sales Mgr., Government & Industrial Division, Philco Corporation, 744 Jackson Pl., N.W., Washington 6, D. C. Home: 308 Pinewood Ave., Silver Spring, Md.

STERMAN, ALBERT P., (m) Assistant Structure Unit Leader, Rocket Dept., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 65 North Park Ave., Buffalo 16, N. Y.

STERN, EDWARD S., (m) Process Engr., Propellant Dept., Thiokol Chemical Corp., Elkton, Md. Home: 16 O'Daniel Dr., Newark, Dela.

STERN, GEORGE, (m) Vice Pres., Technical Director, American Sinteel Corp., 320 Yonkers Ave., Yonkers, N. Y. Home: 345 Maple Ave., Mamaroneck, N. Y.

STERN, ROBERT K., (m) Vice President, Data Reduction & Automation Div., Fischer & Porter Co., Hatboro, Pa. Home: Box 34, Point Pleasant, Pa.

STETSON, KENNETH F., (a) Aeronautical Engr., Aero. Res. Laboratory, Wright Air Development Center, Dayton, O. Home: 418 Darnell Dr., Dayton 3, O.

STEVENS, CALVIN L., (m) Aerodynamicist, Beech Aircraft Corp., Wichita, Kan. Home: 4829 Eastwood, Wichita, Kan.

STEVENS, LEWIS A., (m) Physicist, Flight Evaluation Engr., Aviation Ordnance Department, U. S. Naval Ordnance Test Station, China Lake, Calif. Home: 405 Norma St., Ridgecrest, Calif.

STEVENS, MARTIN L., Chief of Preliminary Design, Kaman Aircraft Corp., Old Windsor Rd., Bloomfield, Conn. Home: 56 Linbrook Rd., West Hartford, Conn.

STEVENS, PHILIP J., (m) Technical Staff, Propulsion Department, Hughes Aircraft Company, Culver City, Calif. Home 6020 W. 86th St., Los Angeles 45, Calif.

STEVENS, VICTOR I., (m) Chief, High Speed Res. Div., NACA, Ames Aeronautical Lab., Moffett Field, Calif. Home: 10415 Berkshire Dr., Los Altos, Calif.

STEWART, DOUGLAS H., (m) Res. Engr. "A", Pilotless Aircraft Division, Preliminary Design Group, Boeing Airplane Company, 7755 East Marginal Way, Seattle, Wash. Home: 11837 21st Ave., S.W., Seattle 66, Wash.

STEWART, RICHARD P., (m) Supervisor, AGT Division, General Electric Co., Evendale, O. Home: 214 Farragut Rd., Greenhills, Cincinnati 18, O.

STICKNEY, HERBERT H., (m) Director of Administration, Grand Central Rocket Co., P. O. Box 111, Redlands, Calif. Home: 1716 Country Club Dr., Redlands, Calif.

STIER, ROBERT M., (s) Univ. of Michigan, Ann Arbor, Mich.

STIFF, RAY C., JR., (m) Manager, Engng. and Res. Division, Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1168, Sacramento, Calif. Home: 3550 Lynne Way, Sacramento 21, Calif.

STINE, GEORGE HARRY, Viking - Aerobee Project Engr., Operations Dept., U. S. Naval Ordnance Missile Test Facility, White Sands Proving Ground, N. M. Home: 1100 Circle Dr., Las Cruces, N. M.

STIPE, CHESTER R., (m) Research Engr., JPL, California Institute of Technology, 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 5029 Merita Place, La Canada, Calif.

STIRMAN, MARION W., (m) Electrical Engineer, Design A, Missile System Div., Engng. Br., Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 7256 Van Alden Ave., Reseda, Calif.

STIRN, RICHARD J., (s) Sp 3, Guided Missile Fire Control Sys. Spec. (Surface to Surface), U. S. Army, 558th FA, Msl. Bn (CPL), Ft. Bliss, Tex. Home: 2431 W. Capitol Dr., Milwaukee, Wis.

STOCKTON, LELAND W., (m) Supv., Electronic Engr., DCS, Communications Hgts., USAFE, APO 633, N. Y. Home: 616 Douglas Ave., Redwood City, Calif.

STOCKWELL, RICHARD E., (a) Technical Communications Specialist, Aircraft Gas Turbine Development Dept., General Electric Co., Cincinnati 15, O. Home: 616 Maple Dr., Cincinnati 15, O.

STOIKO, MICHAEL, (m) Sr. Rocket Prop. Engr., New Design Sec., Glenn L. Martin Co., Baltimore, Md. Home: 8354 Lockraven Blvd., Towson 4, Md.

STONER, GEORGE H., (m) Staff Assistant, Pilotless Aircraft Division, Boeing Airplane Co., Seattle, Wash. Home: 2441 60th Ave., S.E., Mercer Island, Wash.

STONER, WILLIS A., (m) Aerodynamicist, Propulsion Research Corp., 1860 Franklin, Santa Monica, Calif. Home: 5679 Corso Di Napoli, Long Beach 3, Calif.

STOOLMAN, LEO, (m) Head, Aerodynamics Department, Weapon Systems Development Laboratories, Hughes Aircraft Company, Florence & Teale, Culver City, Calif. Home: 530 N. Sunnyslope Ave., Pasadena, Calif.

STORLEE, MANLY L., (s) Indiana Technical College, Ft. Wayne, Ind. Home: 1205 Crescent Ave., Ft. Wayne, Ind.

STRAAYER, HARRY S., (s) Home: 3236 N. Anderson Dr., Tucson, Ariz.

STRAIN, BAILEY T., (m) Captain, USAF, Air Force Development Fld. Rep., Redstone Arsenal, Huntsville, Ala. Home: 1120 Lewellen Ave., Wichita, Kan.

STRAIN, JOHN W., (m) Power Plant Engr., Propulsion Br. EML Div., WSPG, Las Cruces, N. M. Home: 19536 Schoolcraft, Reseda, Calif.

STRANG, WILLIAM C., (m) Service Engr., Convair, A Division of General Dynamics Corp., Pomona, Calif. Home: 2257 Kellogg Park Dr., Pomona, Calif.

STRATTON, HAROLD S., (m) Chief, Propulsion Systems Selection, Rocket Eng. Test Laboratory, Air Force Flight Test Center (FTR), Edwards AFB, Calif. Home: 20 9th St., Edwards, Calif.

STRAW, CLAYTON L., (m) Weight Engr., Goodyear Aircraft Corp., Massillon Rd., Akron, O. Home: 1846 Flint Ave., Akron 5, O.

STREETER, JOHN W., (a) Assistant Director, Fels Planetarium, Franklin Institute, Philadelphia 3, Pa. Home: Chester Springs, Pa.

STRICKHOLM, GEORGE E., (s) Equipment Engr., Electronics Div., W. L. Maxson Corp., 460 W. 34th St., N. Y. 1, N. Y. Home: 20 Post St., Glen Head, Long Island, N. Y.

STRICKLAND, J. D., (a) Assistant to the President, Aircraft Division, Royal Jet, Inc., 1024 Westminster Ave., Alhambra, Calif. Home: 1445 Millar Dr., Glendale 6, Calif.

STROUHAL, GEORGE, (s) Ordnance Design Engr., Guided Missiles Branch, CWL, U. S. Army, Army Chemical Center, Md. Home: Box 324, Alvin, Tex.

STROUKOFF, MICHAEL, (m) Pres. & Chief Engr., Stroukoff Aircraft Corp., W. Trenton, N. J. Home: Main St., Lawrenceville, N. J.

STRUGHOLD, HUBERTUS, (m) Chief, Department of Space Medicine, Medical Sciences Division, School of Aviation Medicine, United States Air Force, Randolph Air Force Base, Randolph Field, Tex. Home: 703 Main St., Schertz, Tex.

STUART, WENDELL F., (m) Rocket Test Foreman, Rocket Test Division, Aerojet-General Corp., Sacramento, Calif. Home: 2439 Verna Way, Sacramento 21, Calif.

STUART, WILLIAM D., (s) Antenna Engr., Microwave Dept., Farnsworth Electronics Co., E. Pontiac St., Ft. Wayne, Ind. Home: 553 West Paris St., Frankfort, Ind.

STUCKY, CURTIS, (a) Technician, Land-Air Inc., Holloman AFB, Alamogordo, N. M. Home: 811 Dewey La., Alamogordo, N. M.

STUDHALTER, WALTER R., (m) Proj. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 21225 Dumetz Rd., Woodland Hills, Calif.

STUHLINGER, ERNST, (m) Research Engr., Redstone Arsenal, GMD Div., Huntsville, Ala. Home: Rt. 4, Box 72-A, Huntsville, Ala.

STULTS, MARION B., (s) Indiana Technical College, 221 East Washington Blvd., Ft. Wayne, Ind. Home: 2508½ New Haven Ave., Ft. Wayne, Ind.

STYNE, HENRY E., (s) Indiana Technical College, 311½ W. Williams, Ft. Wayne, Ind.

SUCH, RONALD W., (s) Purdue University, W. Lafayette, Ind. Home: 3510 Winter St., Ft. Wayne, Ind.

SUCIU, SPIRIDON N., (m) Mgr., Aircraft Gas Turbine Div., General Electric Co., Cincinnati 15, O. Home: 7815 Eustis Ct., Cincinnati, O.

SUDDETH, DAVID H., (m) Physical Detection Branch, Chemical Corps, U. S. Army, Camp Detrick, Frederick, Md. Home: 26 Winchester St., Frederick, Md.

SUGARMAN, MICHAEL N., (s) University of Buffalo, Main St., Buffalo, N. Y. Home: 1046 Walden Ave., Buffalo 11, N. Y.

SUGGS, ROBERT L., (m) President, Offshore Raydist, Inc., P. O. Box 13055, New Orleans 25, La.

SUGIMOTO, ROY, (m) Supervisor, Process Development, Chemical Research Division, Ethyl Corporation, 1600 West Eight Mile Rd., Detroit 20, Mich. Home: 1423 South Wilson, Royal Oak, Mich.

SULLIVAN, LESLIE J., (m) Powerplant Engr., Rocket Div., The Glenn L. Martin Co., Baltimore, Md. Home: 2481 Woodcroft Rd., Baltimore 14, Md.

SULLIVAN, WALTER H., (a) Engr., The Magnavox Co., Bueter Rd., Ft. Wayne, Ind. Home: R.R. #6, Ft. Wayne, Ind.

SULLY, ROBERT J., (m) Architect, Daniel, Mann, Johnson & Mendenhall, 4201 Sunset Blvd., Los Angeles, Calif. Home: 243 N. Saltair Ave., W. Los Angeles, Calif.

SULOWAY, N. S., (m) Mechanical Engr., Military Electronics Div., Motorola Inc., 4545 W. Augusta, Chicago 51, Ill. Home: 707 Leverett. Fayetteville ,Ark.

SUMERLIN, WILLIAM T., (m) Sect. Engr., Industrial Div., Philco Corp., 4700 Wissahickon Ave., Philadelphia 44, Pa. Home: 924 Wootton Rd., Bryn Mawr, Pa.

SUMMERFIELD, MARTIN, (m) Professor, Princeton University, Princeton, N. J. Home: 82 College Rd., Princeton, N. J.

SUMMERS, CHARLES S., (m) Engr., General Electric Co., Evendale, O. Home: 1720 Cedar Ave., Cincinnati 24, O.

SUNDERLAND, DUANE O., Major, U. S. Air Force, Home: 7177-A, Brcok, Ind.

SUPINA, LEO E., (m) Consultant Physicist, Research, M. H. Rhodes Co., Inc., 30 Bartholomew Ave., Hartford, Conn. Home: R. 3, Box 134, Stafford Springs, Conn.

SUTHERLAND, GEORGE S., (a) Research Engr., Power Plant Staff, Boeing Airplane Company, Seattle, Wash. Home: 13729—12th S.W., Seattle 66, Wash.

SUTOR, ALOIS, (m) Sr. Res. Engr., North American Aviation, Inc., 6349 E. Slauson Ave., Los Angeles, Calif. Home: 1714 Maple St., Whittier, Calif.

SUTTON, GEORGE P., (m) Group Leader, Preliminary Design, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 19816 Henshaw St., Woodland Hills, Calif.

SUVADA, WILLIAM J., (m) Sr. Design Engr., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 3556 Quimby, San Diego 6, Calif.

SUZUKI, GEORGE M., (m) Project Engr., Air Force Flight Test Center, Rocket Br., Edwards AFB, Edwards, Calif. Home: 15737 Victory Blvd., Van Nuys, Calif.

SWANEY, FRANK R., (m) Proj. Engr., Missile Branch, Engng. Div., Chrysler Corp., Box 2628, Detroit, Mich. Home: 1738 W. Catalpa Dr., Berkley, Mich.

SWANSON, CONRAD D., (m) Physicist, Army Ballistic Missiles Agency, Redstone Arsenal, Huntsville, Ala. Home: 1808 Evergreen St., Huntsville, Ala.

SWANSON, LYLE M., (m) Res. Engr., Radar and Fire Control, North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 4944 N. Coke Ave., Lakewood 11, Calif.

SWANSON, ROBERT S., (m) Dept. Manager, Aero. & Thermodynamics Dept., Missiles Systems Div., Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 17975 Archwood St., Reseda, Calif.

SWANSON, ROLLIN J., (a) Lt., Ord. Corps., Redstone Arsenal, United States Army, 9330 T.U., Huntsville, Ala. Home: 3417—44th S.W., Seattle 16, Wash.

SWARTWOUT, THOMAS R., (s) Purdue University, Lafayette, Ind. Home: 3416 Wenonah Ave., Berwyn, Ill.

SWARTZ, THEODORE C., (m) General Electric Research Lab., Electron Physics Dept., General Electric Co., Schenectady (P. O. Box 1088), N. Y. Home: P. O. Box 167, Niskayuna, N. Y.

SWEENEY, EDWARD F., JR., (s) Academy of Aeronautics, LaGuardia Airport, Flushing, N. Y. Home: 642 E. 26th St., Brooklyn 10, N. Y.

SWEENEY, GEORGE C., (a) Arthur D. Little, Inc., 30 Memorial Dr., Cambridge, Mass. Home: 74 Mt. Vernon St., Boston 8, Mass.

SWEENEY, WILLIAM J., (m) Vice Pres., Esso Research & Engng. Co., 15 W. 51st St., New York 19, N. Y. Home: 24 Greenbriar Dr., Summit, N. J.

SWEETMAN, WILLIARD JR., (m) Assist. Mgr., Customer Relations, Reaction Motors, Inc., Denville, N. J. Home: Box 523, Sparta, N. J.

SWET, CHARLES J., (m) Sr. Des. Engr., Propulsion Group, Dept. 706, Convair, A Division of General Dynamics Corp., Pacific Highway, San Diego, Calif. Home: 3637 Kite St., San Diego 3, Calif.

SWINGLE, ROBERT L., (s) Purdue University, West Lafayette, Ind. Home: 236 So. 10th St., LaCrosse, Wisc.

SWISHER, ROBERT D., (m) Research Group Leader, Monsanto Chemical Co., Inorganic Div., Everett, Mass. Home: 15 Ledyard Rd., Winchester, Mass.

SYLVANDER, ROY C., (m) Director of Engng., Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J. Home: 162 Linden St., Ridgewood, N. J.

SYLVESTER, VINCENT A., (m) Project Engr., Missile Branch, Engng. Div., Chrysler Corp., Box 2628, Detroit 31, Mich. Home: 15240 Young, Detroit 5, Mich.

SYVERTSON, CLARENCE A., (m) Aero. Res. Scientist, Ames Aeronautical Laboratory, NACA, Moffett Field, Calif. Home: 430 Ravenswood Ave., Apt. 4, Menlo Park, Calif.

SZECSODY, ALEX J., Mechanical Engr., Wayland Laboratory, Raytheon Mfg. Co., Wayland, Mass. Home: 57 Silver Lake Ave., Newton 58, Mass.

SZEKELY, THOMAS, (m) Engr. (Nuclear), Aircraft Nuclear Propulsion Dept., General Electric Co., Cincinnati 15, O. Home: 2217 Victory Parkway, Cincinnati 6, O.

T

TABANERA, TEOFILO A., (m) Engr., Sociedad Argentina Interplanetaria, Tucuman 950, Buenos Aires, Argentina

TAFT, WILLIAM H., (m) Chief, Technical Publications, Aerojet-General Corp., P. O. Box 296, Azusa, Calif. Home: 626 Valinda Ave., West Covina, Calif.

TAIT, ROBERT, (m) Engr., Aircraft Gas Turbine Division, General Electric Company, Evendale, O. Home: 2368 Victory Pkwy., Cincinnati 6, O.

TALAMINI, ARTHUR JR., (m) Engng. Mgr., Technical Products Division, A. B. DuMont Labs., 760 Bloomfield Ave., Clifton, N. J. Home: Shire Ave., Little Falls, N. J.

TALBERT, JOHN WILKIE, JR., (m) Sr. Field Engr., Field Test Operations & Training, Jet Propulsion Laboratory, California Inst of Technology, 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 7669 Grove St., Tujunga, Calif.

TALL, WAYNE A., (s) Purdue University, Unit 535 Harrison Cts., W. Lafayette, Ind. Home: 6850 Black Oaks Rd., Gary, Ind.

TALLMAN, HAROLD L., JR., (m) Res. Engr., North American Aviation, Inc., Box 212, Patrick AFB, Cocoa, Fla. Home: 1310 Pelican Lane, Eau Gallie, Fla.

TANNOUS, PHILIP JR., (a) Quality Test Planning Engr., Hughes Aircraft Co., Box 5555, Tucson, Ariz. Home: 1721 E. Water, Tucson, Ariz.

TARNOW, HERMAN E., (s) Purdue University, Lafayette, Ind. Home: Institute 601, Valparaiso, Ind.

TATTERSALL, RONALD K., (s) 12, Weddell House, Ernest St., London, England.

TAUBER, MICHAEL E., (s) University of Washington, Seattle, Wash. Home: 510 11th Ave. N., Seattle 2, Wash.

TAULBEE, PRESTON L., (m) Res. Spec., Missiles Systems Div., Lockheed Aircraft Corp., 7701 Woodley, Van Nuys, Calif. Home: 18801 Calvert St., Reseda, Calif.

TAYLOR, CLIFFORD L., (m) Test Engr., Aerojet-General Corporation, Irwindale, Azusa, Calif. Home: 8409 Madison Ave., Whittier, Calif.

TAYLOR, JAMES R., (a) Manager, Pan American World Airways, Inc., P. O. Box OMU, Patrick AFB, Fla. Home: 93 Riverside Dr., Patrick AFB, Fla.

TAYLOR, JOHN S., (m) Manager of Rocket Sales, The M. W. Kellogg Co., P. O. Box 469, Jersey City 3, N. J. Home: 65 Manor Dr., Newark, N. J.

TAYLOR, LESLIE G., (m) Dir. of Defense Sales, Kelsey-Hayes Wheel Co., 3600 Military Ave., Detroit 32, Mich.

TAYLOR, RALPH WAYNE, (m) Engng. Assistant., Instrumentation Design J-79 Sect., General Electric Co., Evendale, O. Home: 5 55 Eastwood Dr., Cincinnati 27, O.

TAYLOR, T. R., (m) Contract Requirements Engr., Beech Aircraft Corp., Wichita, Kan. Home: 2227 S. Oliver, Wichita, Kan.

TAYLOR, TRUDE C., (a) General Sales Mgr., Marketing Division, Telecomputing Corporation, 12838 Saticoy St., N. Hollywood, Calif. Home: 4277 Woodleigh Lane, Pasadena, Calif.

TAYLOR, WILLIAM P., (m) Proj. Engr., Accessory Products Corp., Home: 616 W. Whittier Blvd., Whittier, Calif.

TEAGUE, BILLIE D., (a) Industrial Relations Analyst, Convair, A Division of General Dynamics Corp., Ft. Worth, Tex. Home: 5 32 Tracyne Dr., Ft. Worth, Tex.

TEAGUE, THOMAS S., (m) Manager, Malta Operations, Rocket Engg. Section, General Electric Co., Malta Test Station, Ballston Spa, N. Y. Home: 13 Sherwood Lane, Burnt Hills, N. Y.

TEAGUE, WALTER DORWIN, JR., (m) Partner, Walter Dorwin Teague Associates, 444 Madison Ave., New York 22, N. Y. Home: Glen Goin Rd., Alpine, N. J.

TEARNEN, JOHN O., (m) Design Specialist, Engineering Div., Ryan Aeronautical Co., Lindbergh Field, San Diego 12, Calif. Home: 4619 38th St., San Diego 5, Calif.

TEICHMANN, CAROLINE SWIFT, (m) Technical Staff, R&D Labs, Hughes Aircraft Co., Culver City, Calif. Home: 459 Landfair Ave., Los Angeles 24, Calif.

TEMPLETON, THOMAS H., (m) Executive Assistant to the President, Reed and Reese Inc., 717 North Lake Ave., Pasadena, Calif. Home: 1621 Amberwood Dr., South Pasadena, Calif.

TEMPLIN, ROBERT A., (a) Proj. Analyst, Research & Development, Rheem Mfg. Co., 9236 E. Hall Rd., Downey, Calif. Home: 8945 E. Guess St., Rosemond, Calif.

TENENBAUM, DAN M., (m) Mgr., Test Division, Liquid Rocket Plant Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 4405 Surita St., Sacramento 21, Calif.

TEN EYCK, JOHN C., (m) Washington Rep., Carborundum Co., & Landers, Frury & Clark. Home: 1624 Eye St., N.W., Washington 6, D. C.

TERLIZZI, PAUL M., (m) Assist. to Director of Market Development, Stauffer Chemical Co., 380 Madison Ave., New York, N. Y. Home: Mohawk Ave., Rockaway, N. J.

TERRY, DAVID, (a) Instructor, Academy of Aeronautics, LaGuardia Airport, N. Y. Home: 37 Browning St., Badwin, N. Y.

TERRY, R. C., (m) Mgr., Office Services, Rocket Fuels Division, Phillips Petroleum Company, McGregor, Tex. Home: 605 Jackson, McGregor, Tex.

TERWILLIGER, ROY L., (m) Assist. Equipment Engr., Research Dept., United Aircraft Corp., 400 Main St., E. Hartford, Conn. Home: 21 Peach Tree Lane, Glastonbury, Conn.

THACKREY, JAMES D., (m) Sr. Engr., Thrust Chamber Dept., Aerojet-General Corp., Azusa, Calif. Home: 1170 Riviera Dr., Pasadena, Calif.

THACKWELL, HENRY L., Assistant President, Grand Central Rocket Co., Redlands, Calif. Home: 1509 W. Cedar Ave., Redlands, Calif.

THARP, THOMAS A., (m) Washington Rep., General Tire & Rubber Co., 1625 Eye St., S.W., Washington, D. C. Home: 5615 Glenwood Rd., Bethesda, Md.

THATCHER, ALBERT G., (m) Chief, Projects Operations Dept., Engineering & Research Div., Reaction Motors, Inc., Denville, N. J. Home: 125 Ball Rd., Mountain Lakes, N. J.

THEOBALD, O. J., JR., (m) Mgr. Nitrogen Prod., Olin-Mathieson Corp., Baltimore, Md. Home: 13 Maryland Ave., Towson 4, Md.

THIEBLOT, ARMAND J., (m) President, Thieblot Aircraft Co., Inc., 4924 Hampden Lane, Washington 14, D. C. Home: 1324 Hamilton Blvd., Hagerstown, Md.

THIEL, ADOLF K., (m) Senior Staff Engr., Guided Missile Res. Div., The Ramo-Wooldridge Corp., Los Angeles, Calif. Home: 2631 La Costa Pl., Palos Verdes, Calif.

THOMAS, CHARLES F., (m) Corporate Director of Mil. Sales, Lockheed Aircraft Corp., Burbank, Calif. Home: 1726 Allen Ave., Glendale, Calif.

THOMAS, DELBERT D., (m) Proj. Engr., Aviation Division, Olin Mathieson Chem. Corp., 800 Buffalo Ave., Niagara Falls, N. Y. Home: 6919 Buffalo Ave., Niagara Falls, N. Y.

THOMAS, GEORGE HAROLD, (m) Proprietor, Rocket Research and Engineering Co., 42 Bown's Rd., Kolarah, Sydney, Australia.

THOMAS, HAROLD E., (m) Engr., Research and Engng. Div., Harvey Machine Co., Torrance, Calif. Home: Apt. 6, 575 Esplanade, Redondo Beach, Calif.

THOMAS, JOHN P., (m) Lead Technician—James Forrestal Research Center, Princeton University, Princeton, N. J. Home: 14 Titus Ave., Lawrenceville, N. J.

THOMAS, NICHOLAS T., (m) Engr., Rocket Engine Section, General Electric Co., AGT-DD, Bldg. 600, Evendale, O. Home: 6910 Montgomery Rd., Cincinnati 36, O.

THOMAS, RICHARD W., (s) Analytical Dept., Ethyl Res. Corp. Laboratories, 8 Mile Rd., Ferndale, Mich. Home: 30500 Burbank, Farmington, Mich.

THOMAS, WILLIAM H., (m) Mgr., Government Contracts, Air Products, Incorporated, P. O. Box 538, Allentown, Pa. Home: 3134 Diamond Ave., Allentown, Pa.

THOMASON, DENNIS P., (s) Purdue University, W. Lafayette, Ind. Home: 300 Russell, W. Lafayette, Ind.

THOMPSON, DONALD, (m) Mathematician, Missile Flight Surveillance Office, White Sands Proving Ground, N. M. Home: 4517 Leeds St., El Paso, Tex.

THOMPSON, FLOYD J., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8514 Garden Grove Ave., North Ridge, Calif.

THOMPSON, J. GREER, (m) Consolidated Western Steel Div., U. S. Steel Corp., 5700 S. Eastern Ave., P. O. Box 2015, Terminal Annex, Los Angeles 54, Calif.

THOMPSON, ROBERT A., (m) Experimental Test Engr., Pratt & Whitney Aircraft, United Aircraft Corp., 400 Main St., East Hartford 8, Conn. Home: 235 Main St., Apt. 5G4, East Hartford 8, Conn.

THOMPSON, ROBERT J., JR., (m) Supervisor of Propellant Chemistry, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 17167 San Jose St., Granada Hills, Calif.

THOMPSON, WILLIAM R., (m) Development Engr., Project 107A, Research Dept., Aerojet-General Corporation, Azusa, Calif. Home: 2612½ Encino Ave., Monrovia, Calif.

THOMSON, ALFRED G., (m) Res. Engr., Missile Systems Div., Lockheed Aircraft Corp., Holloman AFB, N. M. Home: 1328 Vermont St., Alamogordo, N. M.

THOMSON, WALLACE B., (m) Design Analyst, Aircraft Gas Turbine Div., General Electric Company, Cincinnati 15, O. Home: 9653 Daly Rd., Cincinnati 31, O.

THORNHILL, ROBERT B., (a) Instructor, Department of Engng. Drawing, Wayne University, Detroit, Mich. Home: 14444 Mettetal, Detroit 27, Mich.

THORNTON, JAMES O., (m) Supervisory Aero. Power Plant Devel. Engr., Army Ballistic Missile Agency, Huntsville, Ala. Home: Rt. 3, Box 511, Huntsville, Ala.

THORP, CLARK E., (m) Mgr., Department of Chemistry and Chemical Engng., Armour Research Foundation, 10 West 35th St., Chicago 16, Ill. Home: 442 South Dryden Place, Arlington Heights, Ill.

THORPE, MERLE L., (a) Research Engr., Tonawanda Laboratories, Linde Air Products Co., P. O. Box 44, Tonawanda, N. Y. Home: 47 Dakota St., Buffalo 16, N. Y.

THUE, KENNETH S., (m) Head Aerodynamics Engr., Orenda Engines, Ltd., Box 4015 Terminal "A", Toronto, Ont., Canada. Home: 32 Dartnell Ave., Toronto, Ont., Canada.

THURBER, KENNETH W., (m) Lead Technician, Power Plant, Bell Aircraft Corp., Holloman ADC, N. M. Home: 1405 Indiana Ave., Alamogordo, N. M.

TIERNEY, JAMES A., (s) Academy of Aeronautics, LaGuardia Airport, New York, N. Y. Home: 229 Bay Ridge Ave., Brooklyn 20, N. Y.

TIETJEN, HOWARD F., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 7942 Lurline Ave., Canoga Park, Calif.

TIKANEN, WILLIAM A., (m) Instrument Engr., Genisco, Inc., 223 Federal Ave., Los Angeles 64, Calif. Home: 17763 Lull St., Reseda, Calif.

TILLIAN, DONALD J., (s) New Mexico A & M College, State College, N. M. Home: Box 881, State College, N. M.

TINGLE, WILLIAM W., (m) Proj. Engr., Fuel Flowmeter Division, Pioneer Central, Division of Bendix Aviation Corp., Hickory Grove Rd., Davenport, Iowa. Home: 721 W. 16th St., Davenport, Iowa

TINT, ROBERT S., (m) Design Specialist, Engng. Dept., Republic Aviation Corp., Farmingdale, N. Y. Home: 1430 Waterloo Pl., Far Rockaway, N. Y.

TINUS, WILLIAM C., (m) Vice President, Bell Telephone Labs., Inc., Whippany, N. J. Home: 42 Euclid Ave., Maplewood, N. J.

TIPPETT, WILLIAM J., (s) Capt. Technical Staff Officer, Directorate of Armament Development, Canadian Army, 255 Argyle Ave., Ottawa 4, Ontario. Home: 399 Brittany Dr., Ottawa 2, Ontario, Canada.

TISCHLER, ADELBERT O., (m) Aeronautical Research Scientist, Lewis Flight Propulsion Laboratory, NACA, Cleveland 11, O. Home: 5911 W. 217th St., Parkview Village, Cleveland 26, O.

TITLEY, JOHN H., (m) Contracts Administrator, Gov't. Products Div., Research Development Labs., Rheem Mfg Co., 9236 E. Hall Rd., Downey, Calif. Home: 7210 El Manor Ave., Los Angeles 45, Calif.

TITUS, RICHARD H., (a) Security Analyst, Smith, Barney & Co., 14 Wall St., New York, N. Y. Home: 627 N. Chestnut St., Westfield, N. J.

TOBIAS, GEORGE S., (m) Section Head, Motor Lubricants and Wax Products Research Division, Esso Research & Engineering Co., P. O. Box 51, Linden, N. J. Home: Oakwood Rd., Watchung, Plainfield, N. J.

TOBIAS, LEONARD W., (m) Design Engr., Eclipse-Pioneer Division, Bendix Aviation Corp., Teterboro, N. J. Home: 2 Rosewood Ct., Ramsey, N. J.

TOCCO, ANTHONY R., (m) Member, Technical Staff, Guided Missile Lab., Hughes Aircraft Co., Culver City, Calif. Home: 434 Manitoba St., Playa del Rey, Calif.

TOEVS, FREDERICK C. J., (s) U. S. Army, Ft. Bliss, Tex. Home P. O. Box 134, Dallas, Ore.

TOFTOY, H. N., (f) Brigadier General, Commanding General, Redstone Arsenal, U. S. Army, Huntsville, Ala. Home: Qtrs A-123, Redstone Arsenal, Huntsville, Ala.

TOMA, RICHARD, (s) Brooklyn Polytechnic Institute, 85 Livingston St., Brooklyn, N. Y. Home: 266 Oder Ave., Staten Island 4, N. Y.

TOMAK, M. E. (a) M. D., 289 No. Main, Linton, Ind. Home: 210 N.E. 9th, Linton, Ind.

TOMAN, WILLIAM, (m) Develop. Engr., Aerophysics, Goodyear Aircraft Corp., Massillon Rd., Akron, O. Home: 1746—4th Street, Cuyahoga Falls, O.

TOMAZIC, WILLIAM A., (m) Aeronautical Res. Scientist, Rocket Br., Lewis Flight Prop. Lab., NACA, 21000 Brookpark, Cleveland, O. Home: 3154 W. 90, Cleveland 2, O.

TOMBAUGH, CLYDE W., (f) Chief Investigator, Satellite Search, Physical Science Lab., New Mexico College A & MA, State College, N. M. Home: 636 S. Alameda, Las Cruces, N. M.

TONEY, HAROLD E., (m) Missile Mech., Florida Field Test Unit, Boeing Airplane Co., Box 820, Melbourne, Fla. Home: Box 441, Eau Gallie, Fla.

TOPORECK, EDWARD R., (m) Director, Systems Test Staff, Ramo-Wooldridge Corp., 8820 Bellanca Ave., Los Angeles, Calif. Home: 5209 Maymont, Los Angeles 43, Calif.

TORDA, T. PAUL, (m) Prof., Mechanical Engng., Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn 1, N. Y. Home: 100 Remsen St., Brooklyn 1, N. Y.

TORMEY, JOHN F., (m) Group Leader, North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Home: 23360 Ostronic Dr., Woodland Hills, Calif.

TORSTRUP, FRED E., (m) Test Engineer, Experimental Test Engrs., Wright Aero. Div., Curtiss-Wright Corp., Wood Ridge, N. J. Home: 15 Gardner Rd., Denville, N. J.

TOWNSEND, SAMUEL J., (m) Chief of Propulsion, Engng., Chance Vought Aircraft, Incorporated, P. O. Box 5907, Dallas 22, Tex. Home: 4417 McFarlin Blvd., Dallas, Tex.

TOWNSEND, THOMAS H., (m) Aerodynamics Engineer-Senior, Lockheed Aircraft Corp., Marietta, Georgia. Home: 4555 Northside Dr., N.W., Atlanta, Ga.

TRASKO, EDWARD H., (m) Structural Engr., 49 Bretton Rd., West Hartford, Conn.

TRAVERS, WILLIAM R., (m) Mgr. of Marketing, AGT Development Dept., General Electric Co., Cincinnati 15, O. Home: 7512 S. Mingo Dr., Madeira, O.

TRAYLOR, JOHN E., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 6444 Glade, Canoga Park, Calif.

TREFNY, RICHARD B., (m) Director, Aero. Engng. Dept., Parks College of Aeronautical Technology, East St. Louis, Ill. Home: 927 Drummond Dr., Ferguson 21, Mo.

TREW, ROBERT O., (a) Des. Engr., Liquid Rocket Plant, Aerojet-General Corp., P. O. Box 1168, Sacramento, Calif. Home: 5932 Mendocino Blvd., Sacramento, Calif.

TRIPPE, JUAN T., (m) Pres., Pan American World Airways, Inc., 135 E. 42nd St., New York 17, N. Y.

TRUAX, ROBERT C., (m) Commander, USN, Western Development Div., ARDC, U. S. Air Force, 5700 Arbor Vitae, Inglewood, Calif. Home: 18 Wideloop Rd., Rolling Hills, Calif.

TRULY, RICHARD H., (m) Engr., Preliminary Design Dept., Pilotless Aircraft Division, Boeing Airplane Company, Seattle, Wash. Home: Box 5, Bothell, Wash.

TRUPIN, CAROL ANN, (s) Engng. Assistant, J-79 Controls Analysis, Aircraft Gas Turbines Division, General Electric Company, Evendale Plant, Cincinnati 15, O. Home: Apt. 5, 915 Barry Lane, Cincinnati 29, O.

TSCHINKEL, JOHANN G., (m) Chief, Combustion and Fuel Section, Army Ballistic Missile Agency, Redstone Arsenal, Huntsville, Ala. Home: 115 N. Plymouth, Huntsville, Ala.

TUBRIDY, EDWARD H., (m) Electronic Engr., Instrumentation Dept., Goodyear Aircraft Corp., Holloman AFB, N. M. Home: 2004 Florida, Alamogordo, N. M.

TUCKER, JAMES D., JR., (m) Philco Tech. Rep. HQs, Strategic Air Command, Offutt AFB, Neb. Home: 407 West 30th St., Bellevue, Neb.

TUCKERMAN, ALFRED G., (a) Maj. Gen., Associate Engr., William E. Hill & Co., Inc., 640 5th Ave., New York 21, N. Y. Home: 125 E. 74th St., New York 21, N. Y.

TUHY, IVAN E., (m) Design Specialist, Solid Propellants & Explosives, Engng. Div., The Glenn L. Martin Co., Baltimore 3, Md. Home: 1833 Northern Pkwy, Baltimore 12, Md.

TULLOCK, GORDON, (m) Foreign Service Officer, Office of Intelligence and Research, Department of State, U. S. Government, Washington, D. C. Home: 2121 Virginia Ave., N.W., Wash., D. C.

TUOMEY, JOHN, (a) Supervisor Product Design, Maxon Instruments, 47-30 Austel Place, Long Island City, N. Y. Home: 27 Borage Place, Forest Hills 75, N. Y.

TURETZKY, ARTHUR A., (m) Sr. Project Engr., Cook Research Labs., 8100 N. Monticello, Skokie, Ill. Home: 4821 N. Avers, Chicago 25, Ill.

TURKELTAUB, JACK R., (m) Physicist, Guided Missile & Rocket Br., Army Chemical Center, Md., Home: 6B Nuttal Ave., Edgewood, Md.

TURNER, ARTHUR D., (m) Home: 54 Goss Ave., Melrose 76, Mass.

TURNER, ALVIN F., (s) Instructor in the South East Signal School, Instructor Co. D, TSESS, Camp Gordon, Ga. Home: 3604 Terrace Lane, Granite City, Ill.

TURNER, ARTHUR A., (m) Mgr. Engng. Br., Refractories Division, Carborundum Co., Perth Amboy, N. J. Home: 153 Lake Ave., Metuchen, N. J.

TURNER, BURR V., (m) Engng. Officer, Bureau of Aeronautics Representative, Engineering Division, McDonnell Aircraft Corporation, P. O. Box 516, St. Louis 1, Mo. Home: 4 St. Alfred Rd., St. Louis County 24, Mo.

TURNER, HENRY L., (m) Home: 86 E. Galbraith Rd., Cincinnati 16, O.

TURNER, KENNETH A., (m) Research Engineer, Dept. 596, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 4938 Calderon Rd., Woodland Hills, Calif.

TURNER, WARREN P., (m) Mgr., Customer Relations & Contracts Division, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: Wood's End Rd., Morris Plains, N. J.

TYPALDOZ, Z. A., (m) Research Engineer, Jet Propulsion Lab., California Inst. of Tech., Pasadena, Calif. Home: 16750 Lawnwood St., Puente, Calif.

TZANTZOS, GEORGE J., (a) Associate Engr., Propulsion and Structures, Armour Research Foundation, 10 W. 35th St., Chicago, Ill. Home: 4865 N. Rockwell, Chicago 25, Ill.

U

UEHLINGER, A. E., (m) Assist. Fld. Mgr. Sandia Base, Atomic Energy Commission, Albuquerque, N. M. Home: 3361—48th Loop, Sandia Base, N. M.

UHL, EDWARD G., (f) Vice President, Operations, The Glenn L. Martin Company, Baltimore 3, Md. (Mail No. 8). Home:901 Army Rd., Ruxton 4, Md.

UNTERBERG, WALTER, (m) Sr. Thermodynamics Engr., Powerplants Engng. Subdivision, Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 7518 Gaviota Ave., Van Nuys, Calif.

UNGER, CHARLES M., (s) Purdue University, 101 W. Fowler, W. Lafayette, Ind. Home: Rt. 1, Frankfort, Ind.

URBANOVSKY, ERNEST J., (m) Research, North American Aviation, Inc., Santa Susana, Calif. Home: 6949 Topanga Canyon Blvd., Canoga Park, Calif.

URDANETA, ILDEMARO, (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne, Ind. Home: Caracas, Venezuela.

URBACH, EVERETT J., (m) Assistant St. Engr., "Project Vanguard", Liquid Engine Division, Aerojet-General Corp., Azusa, Calif. Home: 1831 So. Delford Ave., Duarte, Calif.

USELLER, JAMES W., (m) Aeronautical Research Scientist, Eng. Res. Division, NACA, 21000 Brookpark Rd., Cleveland 11, O. Home: 1221 Orchard Park Dr., Rocky River 16, O.

UTVIK, DONALD H., (s) Purdue University, Lafayette, Ind. Home: 53 Morris Parkway, Valley Stream, N. Y.

V

VAIL, GORDON T., JR., (s) Purdue University, West Lafayette, Ind. Home: 916½ North St., Lafayette, Ind.

VALE, HERBERT J., (m) Propulsion Analyst, Chance Vought Aircraft Co., Grand Prairie, Tex. Home: 2802 Poinsettia, Tex.

VANCE, EDWARD M., (m) Vice-President, Engng., Professional Consultants, 35 So. Raymond Ave., Pasadena, Calif. Home: 415 So. Second Ave., Arcadia, Calif.

VANDEN HEUVEL, GEORGE R., (m) Major, USAF, Western Development Div., Hqrs. ARDC, P. O. Box 262, Inglewood, Calif. Home: 7811 Emerson Ave., Los Angeles 45, Calif.

VANDENKERCKHOVE, JEAN A., (a) Assistant, Institut d'Aeronautique, Universite Libre de Bruxelles, 50. av. F. D. Roosevelt, Bruxelles, Belgium. Home: 285 av. Louise, Bruxelles, Belgium

VAN DER WAL, FRANKI L., (m) Aerodynamicist "A", Aircraft Engng., Rheem Manufacturing Co., Research & Development Lab., 9236 E. Hall Road, Downey, Calif. Home: 7506 E. Firestone Blvd., Downey, Calif.

VAN DE VERG, NATHANIEL, (m) Technical Specialist, Aerojet-General Corp., Azusa, Calif. Home: 86 E. Mira Monte, Sierre Madre, Calif.

VANDE VREDE, ROBERT G., Project Engineer, Chemistry Division, Atlantic Research Corp., 901 N. Columbus St., Alexandria, Va. Home: 1008 10th St., Apt. A-2, Alexandria, Va.

VAN DYKE, WILLIAM D., (m) Vice-President, Engng., Instrument Division, Van Dyke Textigraph Co., Inc., 23 West Second Street, Chattanooga 2, Tenn. Home: 504 Fleetwood Drive, Lookout Mountain, Tenn.

VAN HOEK, F. M. C., (a) Royal Dutch Airlines (KLM), Schiphol Airport, Amsterdam, Holland. Home: Vinkenstratt 36, Zandvoort, Holland.

VANIK, MILFORD F., (m) Chief of Tech. Staff, Wichita Div., Engng. Dept., Boeing Airplane Co., Wichita, Kans. Home: 11 Sequoia Dr., Wichita 8, Kans.

VANKIRK, THEODORE J., (m) Engr., Electrochemicals Dept., E. I. du Pont de Nemours & Co., Wilmington 98, Del. Home: 10 E. Stephen Drive, Newark, Del.

VAN LONKHUYZEN, JOHN H., (m) Chief, Technical Department-Engng., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 8909 Champlain Ave., Niagara Falls, N. Y.

VANNELLI, RENSO JOHN, (m) Sr. Engr., Ford Motor Co., Aircraft Engng. Div., 7401 S. Cicero, Chicago, Ill. Home: 2126 W. 2[illegible]th St., Chicago 8, Ill.

VAN PELT, JOHN M., (m) Aerodynamicist, The Martin Co., P. O. Box 179, Denver, Colo. Home: c/o General Delivery, Denver, Colo

VAN PHELAN, LOUIS, (m) General Mgr., Electrofilm, Inc., 7116 Laurel Canyon, No. Hollywood, Calif. Home: 12250 Shetland Lane, Los Angeles 49, Calif.

VAN ORNUM, D. M., (m) Northwest Regional Rep., Aerojet General Corp., Azusa, Calif. Home: 7100 Sunnycrest Rd., Seattle [illegible]8, Wash.

VAN VECHTEN, C. THOMAS, (s) Michigan State College, East Lansing, Mich. Home: 4606 Langdrum Lane, Chevy Chase 15, Md.

VAN VOORHEES, WALTER O., (m) Missile Power Plant Design Engr., Missiles Engng., Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 720 Ocampo Dr., Pacific Palisades, Calif.

VARVARO, ANTHONY J., (s) Academy of Aeronautics, LaGuardia Airport, Flushing 71, N. Y. Home: 117 Grove St., Brooklyn 21, N. Y.

VASILION, PETER, (s) University of Buffalo, Buffalo, N. Y. Home: 25 Seneca Parkside, Buffalo 10, N. Y.

VASILIU, JOHN, (m) Research Engineer, Mech. Eng. Dept., Columbia University, New York 27, N. Y. Home: 190-04 42nd Ave., Flushing 58, N. Y.

VAUGHAN, JOHN A., (m) Vice President, Res. & Devel. Division, The W. L. Maxson Corp., 460 West 34th St., New York 1, N. Y. Home: 20 Ingraham Lane, Hempstead, N. Y.

VAUGHT, WILLIAM A., (a) Mech. Designer, Engng. Dept., Engineering & Research Corp., Div. of ACF Industries, Riverdale, Md. Home: 800 Northampton Dr., Silver Spring, Md.

VEGA, JOSE W., (s) Assistant in Research, James Forrestal Research Center, Princeton University, Princeton, N. J. Home: 9 Lockwood Drive, Roselle, N. J.

VEHKO, VAINO J., (m) Gen. Supv. Product Design, Missile Branch, Chrysler Corp., P. O. Box 2628, Detroit 31, Mich. Home: 17290 Shaftsbury, Detroit 19, Mich.

VELLEQUETTE, MURLIN J., (a) Assoc. Engr., Farnsworth Electronics Co., Pontiac St., Ft. Wayne, Ind. Home: 1404 Curdes, Ft. Wayne, Ind.

VENEKLASEN, PAUL S., (m) Director, Western Electro-Acoustic Laboratory, 11789 San Vicente Blvd., Los Angeles 49, Calif. Home: 2179 Mandeville Canyon Road, Los Angeles 49, Calif.

VENERDI, VINCENT P., (a) Mech. Designer, Special Devices, Austin Co., 76 - 9th Ave., New York, N. Y. Home: 1863 W. 13th St., Brooklyn 23, N. Y.

VERBA, MICHAEL, Jr., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8704 El Manor Ave., Los Angeles 45, Calif.

VERKOVILLE, ROBERT D., (m) Des. Engr., Pratt & Whitney Aircraft Co., 400 Main St., E. Hartford, Conn. Home: 129 Newington Ave., Hartford, Conn.

VER VOORN, FLOYD, (s). Home: 24 Barnert Place, Paterson 2, N. J.

VICENTE, FRANCIS A., (s) Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y. Home: 544 West 163rd St., New York 32, N. Y.

VIEMEISTER, PETER E., (m) Prelim. Design Engr., Grumman Aircraft Engineering Corp., Bethpage, N. Y. Home: 31 Briarcliff Place, Huntington 14, N. Y.

VIETS, WILLIAM D., (a) Proj. Engr., Associated Engineers, Inc., 1 Silver St., Agawam, Mass. Home: 192 Edendale St., Springfield, Mass.

VIGIL, JUAN G., (m) Mech. Engr., Missile Systems Div., Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 19139 Strathern St., Reseda, Calif.

VIGNOT-VAN BEUREN, ALFRED J., (a) Assistant Secretary, Chemical Corn Exchange Bank, Corporate Trust Dept, 30 Broad St., New York 15, N. Y. Home: 108 Lord Kitchener Rd., New Rochelle, N. Y.

VIKLUND, VIDAR, (m) Mechanical Engr., Spec. Prod. Div., A. C. F. Industries, Inc., 30 Church St., N. Y. C, N. Y. Home: 41-49 73rd St., Jackson Hts, N. Y.

VILLIERS, CHARLES AMHERST, (m) Engng. Liaison Europe, Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J. Home: 491 W. Saddle River Road, Ridgewood, N. J.

VINCEK, MICHAEL T., (m) 117 Center St., Clifton, N. J.

VINCENT, GEORGE P., (m) Director of Government Services, Chemical Divisions, Olin Mathieson Chemical Corp., 10 Light St., Baltimore 3, Md. Home: 104 Tuscany Road, Baltimore 10, Md.

VINCENT, JOSEPH G., (m) Chief, Inspection Branch, Inspector General's Office, Rome Air Development Center, Griffiss Air Force Base, Rome, N. Y. Home: 1107 N. James St., Rome, N. Y.

VINCENT, NATHANIEL R., (m) Equipment Engr., Aircraft & Missiles Components, Douglas Aircraft Co., Santa Monica, Calif. Home: 906 Cauthen, Alamogordo, N. M.

VINCZE, JOHN, (s) Parks College of Aeronautical Tech., East St. Louis, Ill. Home: 7009 W. Main St., Belleville, Ill.

VINOKUR, MARCEL, (s) Research Scientist Associate, Aerophysics Division, Lockheed Missile System Division, 7701 Woodley Ave., Van Nuys, Calif. Home: 8762 Baird Ave., Northridge, Calif.

VINSONNEAU, FERNAND GABRIEL, (m) Director Technique, Societe Nationale de Constructions Aeronautiques du Sud-Ouest, 2 Rue de Larnac, Courbevoie (Seine), France.

VIRGA, RUSSELL A., (m) Quality Control Engr., Quality Assurance Department, Aerojet-General Corporation, 6352 N. Irwindale Ave., Azusa, Calif. Home: 1140-E. Ada Ave., Glendora, Calif.

VOGEL, JACK MORRIS, (m) Member, Technical Staff, Guided Missile Research Div., The Ramo-Wooldridge Corp., 5760 Arbor Vitae, Los Angeles 45, Calif. Home: 4209 Don Felipe Dr., Los Angeles 8, Cal.

VOGEL, WILLIAM F., (m) Consulting Professional Engr., 1457 Broadway, New York 36, N. Y. Home: Cedar Hill Devel., Hollow Road, Wingdale, N. Y.

VOGT, ALEX G., (m) Mechanical Engr., Raytheon Mfg. Co., S. Lowell, Mass. Home: 21 Lafayette St., Marblehead, Mass.

VOGT, PAUL R., (m) Group Leader, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 7901 E. Harper, Downey, Calif.

VOLK, JOSEPH A., (m) Director of Research, The Greenleaf Mfg. Co., 7814 Maplewood Ind. Ct., St. Louis 17, Mo. Home: 7635 Winchester Dr., Normandy 20, Mo.

VON BRAUN, MAGNUS, (m) Aeronautical R&D Engr., Redstone Arsenal, Guided Missile Development Div., Huntsville, Ala. Home: 1931 Villa Rd., Birmingham, Mich.

VON BRAUN, WERNHER, (m) Chief, Guided Missile Development Div., Redstone Arsenal, Huntsville, Ala. Home: 907 McClung, Huntsville, Ala.

VON KARMAN, THEODORE, (f) Chairman, Advisory Group for Aeronautical Research and Development, NATO, Palais de Chaillot, Paris, France. Home: 1501 S. Marengo Ave., Pasadena, Calif.

VORWERK, VERN R., (m) Design Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Ave., Canoga Park, Calif. Home: 1245 W. Santa Barbara, Los Angeles 37, Calif.

VREELAND, ARTHUR E., (m) Manager, Fabrication & Maintenance, R.C.A. Service Company, Patrick AFB, Fla. Home: Palm Ave., A1A Ocean Park, Melbourne, Fla.

VREELAND, MAXINE GRAMMER, (a) E.O.C. "A", Production Planning, Northrop Aircraft, Inc., Box 338 OMU, Patrick AFB, Fla. Home: Palm Ave., AIA Ocean Park, Melbourne, Fla.

VROOM, ROBERT C., (a) Vice President, Peabody Engineering Corp., 232 Madison Ave., New York 16, N. Y. Home: 60 Edgemont Rd., Montclair, N. J.

W

WADE, SYDNEY L., (m) Foreman, Production, Hughes Aircraft Corp., Nogales Highway, Tucson, Ariz. Home: 1513 W. Winstel, Tucson, Ariz.

WADEKAMPER, LLOYD R., (s) Indiana Technical College, 221 E. Washington Blvd., Ft. Wayne 2, Ind. Home: 3024 Taylor St., Ft. Wayne, Ind.

WAER, RICHARD R., (m) Executive Engr., Guided Missile Laboratory, Federal Telecommunication Laboratories, 500 Washington Ave., Nutley, N. J. Home: 49 Daily St., Nutley, N. J.

WAGNER, CHARLES E., (a) Photographer, Aircraft Gas Turb. Div., General Electric Co., Lockland Highway, Evendale, O. Home: 332 Oak St., Ludlow, Ky.

WAGNER, EDWARD W., (m) Vice President, Truline Process Div., Stephen M. Wagner, Inc., 2235 Chouteau Ave., St. Louis 3, Mo. Home: 3950-A Wilmington, St. Louis 16, Mo.

WAGNER, HERBERT A., (m) Pres. & Chief Engr., H. A. Wagner Co., 14707 Keswick St., Van Nuys, Calif. Home: P. O. Box 327, Thousand Oaks, Calif.

WAGNER, JULIUS A., (a) Pilot, Colonial Airlines, Hangar 6, LaGuardia Field, New York. Home: 119-50 - 233rd St., Cambria Hts. 11, N.Y.

WAGNER, NATHAN, (m) Asst. Chief Missile Flight Safety Officer, Ord. Corps., WSPG, New Mex. Home: 1765 S. Alamos, Las Cruces, N. M.

WAHLIN, HUGH R., (m) Design Engr., Liquid Eng. Div., Aerojet-General Corp., 6352 N. Irwindale Ave., Azusa, Calif. Home: 320 E. Hurst St., Covina, Calif.

WAKEFIELD, CHARLES W., (m) Military Coordinator, Military Sales Department, Missile System Div., Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 17447 Lahey St., Granada Hills, Calif.

WAKEFORD, RONALD C., (m) Aeronautical Engr., Design Office, Republic Aviation Corp., Farmingdale, L. I., N. Y. Home: RFD Cold Spring Rd., Syosset, L. I., N. Y.

WALKER, CHARLES R., Jr., (m) Proj. Coordinator, Model 7 Test Section-Engr., Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 3924 Calavo Dr., La Mesa, Calif.

WALKER, CURTIS L., (m) Aeronautical Research Scientist, Propulsion Division, Hqt's Office, NACA, 1512 H. St., N.W., Washington 25, D. C. Home: 7506 Nottoway Place, Springfield, Va.

WALKER, E. J., (s) Research Assoc., Chem. Engng. Dept., Syracuse University, D-Z Collindale, Syracuse 10, N. Y. Home: 101 Winchell Rd., Syracuse 10, N. Y.

WALKER, FRANK J., (m) Engr., Thrust Chamber Injectors, Aircraft Gas Turbine Development Dept., General Electric Co., Malta Test Station, Ballston Spa, N. Y. Home: 756 Sixth Ave., Troy, N. Y.

WALKER, HARRY W., (s) Parks College of Aero. Tech., East Saint Louis, Ill. Home: 2525 East 24th St., Granite City, Ill.

WALKER, LLOYD, A., (a) Math. & Physics, Electronics Instructor, San Mateo High School, San Mateo, Calif. Home: Hillside Dr., Burlingame, Calif.

WALKER, MARVIN J., (m) Design Engr., Missile & Radar Sect., Radio Corporation of America, Borton Landing Rd., Moorestown, N. J. Home: 4337 Baltimore Ave., Philadelphia 4, Pa.

WALKER, THORP B., (m) Sr. Engr., Liquid Eng. Div., Aerojet-General Corp., Azusa, Calif. Home: 131 So. Heathdale, Covina, Calif.

WALKOWICZ, TEDDY F., (m) Investment Advisor, Staff of Laurance S. Rockefeller, 30 Rockefeller Plaza, (Room 5600), New York 20, N. Y. Home: 103 E. 84th St., New York 28, N. Y.

WALL, JOHN V., (m) Program Engr., Ordinance Ammunition Command, U. S. Army, Joliet, Ill. Home: 1117 Barthelme Ave., Joliet, Illinois

WALL, MARVIN R., (m) P. O. Box 5243, East San Diego Station, Calif.

WALLER, CECIL E., (m) Devel. Engr., Aerojet-General Corp., Azusa, Calif. Home: 425 E. Laurel, Glendora, Calif.

WALSH, EDWARD B., (m) Supervisor of Planning, Engng., Reaction Motors, Inc., Ford Road, Denville, N. J. Home: 426 Church St., Boonton, N. J.

WALSH, FRANK VAN WORMER, (m) Sr. Project Engr., M. W. Kellogg Co., Ft. of Danforth Ave., Jersey City, N. J. Home: 1703 Well Dr., Fair Lawn, N. J.

WALTER, DON L., (m) Vice President-Engng., Engng. Dept., Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 18096 Boris Drive, Encino, Calif.

WALTON, A. LEE, (m) Group Leader-Nike B Power Plant, Engng. (Dept. A-260), Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 2227 Pearl St., Santa Monica, Calif.

WALTON, LYNN H., (m) Technical Staff, Weapons Systems Development Lab., Dept. 1500, Hughes Aircraft Co., P. O. Box 5555, Tucson, Ariz. Home: 5655 E. 6th St., Tucson 12, Ariz.

WALZ, LOUIS E., (m) Spec. Staff Rep., Arma Div., American Bosch-Arma Corp., Roosevelt Field, Garden City, N.Y. Home: 146 Lagoon Blvd., Massapequa, N. Y.

WANG, DAVID K., (m) Design Engr., Solid Eng. Div., Aerojet-General Div., Azusa, Calif. Home: 330 S. Craig Ave., Pasadena 10, Calif.

WANGSGARD, ALTON P., (m) Proj. Mgr., Guided Missile Laboratories, Hughes Aircraft Co., Florence Ave. at Teale St., Culver City, Calif. Home: 710 Twenty-first Place, Santa Monica, Calif.

WAPNER, JOSEPH F., (m) Chief Engr., Data Reduction & Automation, Fischer & Porter Co., Hatboro, Pa.

WARD, GEORGE H., (m) Specialist-Aircraft Engines, A.&D.I., General Electric Co., 200 E. 1st, Wichita 1, Kans. Home: 1713 Greenacres, Wichita, Kans.

WARD, JAMES E., (s) Univ. of Michigan, Ann Arbor, Mich. Home: 900 Marshall, Green Bay, Wisc.

WARD, RONALD BENTLEY R., (a) Draftsman, Timbrol, Ltd., Walker St., Rhodes, N.S.W., Australia. Home: 6 Empire Ave., Concord, N.S.W., Australia.

WARDEN, HAROLD H., (m) General Sales Mgr., Curtiss-Wright Corp., Propeller Div., P. O. Box 301, Caldwell, N. J. Home: 225 No. Mountain Ave., Montclair, N. J.

WARFEL, JOHN S., (m) Mgr. of Research, Aerojet General Corp., Azusa, Calif. Home: 1247 E. Sierra Madre, Glendora, Calif.

WARING, HENRY F., (m) Chief Engr., Military Aircraft, Cessna Aircraft Co., Wichita, Kans. Home: 2445 Cheyenne, Wichita 16, Kans.

WARREN, ALOIS P., (m) D.M.D., 40 Central Park So., New York 19, N. Y. Home: 515 E. 89th St., New York, N. Y.

WARREN, FRANCIS A., (m) Propellant Techn., Dept. of Chemistry & Chemical Engng., Southwest Research Institute, 8500 Culebra Rd., San Antonio 6, Tex. Home: 119 Sunnycrest Drive, San Antonio 1, Tex.

WARREN, JOHN E., (m) Chief Systems Engr., Systems Div., Airborne Accessories Corp., 1414 Chestnut Ave., Hillside, N. J. Home: 148 Fairway Ave., Belleville 9, N. J.

WARREN, STUART A., (m) Research Engr., North American Aviation, Inc., Los Angeles, Calif. Home: 763 S. Oakland Ave., Pasadena 5, Calif.

WARREN, VICTOR M., (m) Test Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 7850 E. Foothill Rd., Ventura, Calif.

WARREN, WALTER R., (m) Engr., Advanced Aero-Thermodynamic Experimentation, Special Defense Projects Dept., General Electric Co., 2600 Campbell Ave., Schenectady 6, N. Y. Home: 23 Mohawk Manor, Schenectady 6, N. Y.

WARREN, WILLIAM H., (s) 1st G.M. Brigade Detachment, WSPG, N. M. Home: 3202 W. 10th St., Topeka, Kans.

WARNER, CECIL F., (m) Prof. of Mech. Engng., Purdue Univ., West Lafayette, Ind. Home: 1019 S. 12th, Lafayette, Ind.

WARNER, ROGER S., Jr., (m) Vice President, Cambridge Corp., Industrial Park, Lowell, Mass. Home: 81 Mt. Vernon St., Boston, Mass.

WARRICK, STUART C., Jr., (s) Ballistics Reduction Section, Physical Science Laboratory, Box 62, State College, N. Mex. Home: Box 1085, Silver City, N. M.

WASMANSDORFF, C., (m) Vice Pres., Engng., Hoffman Laboratories, Inc., 3761 South Hill St., Los Angeles, Calif.

WASSALL, JOHN B., (m) Dir. of Engng., Lockheed Aircraft Corp., Burbank, Calif.

WATERMAN, NEIL J., (m) Test. Engr., Cornell Aeronautical Lab., Inc., 4455 Genesee St., Buffalo 21, N. Y. Home: 1201 Lee's Dr., Las Cruces, N. M.

WATERS, WILLIAM L., (m) 69th Tactical Missile Sqd., APO 109, New York, N. Y.

WATMAN, HERBERT, (s) Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y. Home: 1660 Topping Ave., Bronx 57, N. Y.

WATSON, JOHN E., (m) Mech. Engr., U.S. Naval Ord. Lab., White Oak, Md. Home: 874 Medford Dr., Cleveland Hts., Ohio

WATSON, THOMAS F., (m) Chief Instrumentation, U. S. Air Force Experimental Rocket Test Sta., Edwards A. F. Base, Calif. Home: 44008 N. 10th St., W. Lancaster, Calif.

WAUGAMAN, CHARLES A., (m) Development Engr., B. F. Goodrich Chemical Co., Experimental Sta., Avon Lake, Ohio. Home: 154 Fairfield Rd., Avon Lake, Ohio.

WAXMAN, STANLEY, (m) Director of Res. and Develop., Grand Central Rocket Co., Box 111, Redlands, Calif. Home: 730 Roosevelt Rd., Redlands, Calif.

WAY, STEWART, (m) Sec. Mgr.-Thermodynamics, Westinghouse Research Labs., Beulah Rd., Pittsburgh 35, Pa. Home: 2307 Forest Dr., Pittsburgh 35, Pa.

WEAD, ROBERT K., (m) Chief Application Engr., Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 4920 Oak Lane Dr., Encino, Calif.

WEATHERRED, CHARLES J., (m) Staff Assist. Business Management, Missile Operations, Chrysler Corp., P. O. Box 2628, Detroit 31, Mich. Home: 18209 Stoepel, Detroit 21, Mich.

WEBB, WILBUR L., (m) Gen. Mgr., Bendix Products Division, Bendix Aviation Corp., 400 South Beiger St., Mishawaka, Ind. Home: 2724 S. Twyckenham Drive, South Bend, Ind.

WEBB, WILLIAM A., (m) Project Engr., Ordnance Division, Aircraft Armaments, Inc., Cockeysville, Md. Home: 4227 South Ave., Baltimore 6, Md.

WEBB, WILLIS L., (m) Meteorologist, Atmospheric Physics Section, White Sands Signal Corps Agency, White Sands Proving Ground, New Mexico. Home: 4921 Blue Ridge Dr., El Paso, Tex.

WEBBER, WILLIAM T., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 16198 Sunset Blvd., Pacific Palisades, Calif.

WEBER, CLARE, (a) Wildenstein & Co., Inc., 19 E. 64th St., New York 12, N. Y. Home: 319 E. 51st St., New York 22, N. Y.

WEBER, HAROLD M., Jr., (m) Supervisor, General Electric Co., Lockland Highway, Evendale, O. Home: 26 Cromwell Road, Greenhills 18, O.

WEBER, LAWRENCE A., (m) Crew Chief, Field Test Div., Bell Aircraft Corp., HAFB, N. Mex. Home: Box 961, 1515 Alaska, Alamogordo, N. M.

WEBER, LAWRENCE D., (m) Sr. Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. 9300 Bianca Ave., Northridge, Calif.

WEBER, MATTHEW, Jr., (m) Chief Chemical Engr., Redstone Div., Thiokol Chemical Corp., Huntsville, Ala. Home: Route 4, Box 177, Huntsville, Ala.

WEBER, WILLIAM F., (m) Mgr., Army Controls, Ford Instrument Co., 31-10 Thomson Ave., Long Island City, N. Y. Home: RFD 5, Huntington, N. Y.

WEBSTER, HARRY L., (m) Lab. Tech., Aerojet-General Corp., Sacramento, Calif. Home: 3013 K. St., Sacramento 16, Calif.

WEBSTER, PAUL W., (m) Profesional Engr. Home: 270 Robincroft Dr., Pasadena 6, Calif.

WEBSTER, WARREN, (m) President, Warren Webster & Co., 1625 Federal St., Camden 5, N. J. Home: "Holly House," Pine Valley Golf Club, Clementon, N. J.

WEGNER, EARL T., (m) Assistant Flight Test Engr., North American Aviation, Inc., 4300—5th Ave., Columbus, O. Home: 1617 Arlington Ave., Columbus 11, O.

WEHNER, GOTTFRIED K., (m) Physicist, Mech. Div., General Mills, Inc., 2003 E. Hennepin Ave., Minneapolis, Minn. Home: 6017 Walnut Drive, Minneapolis 24, Minn.

WEHRLI, ROBERT L., (m) General Mgr., Aeronautical Division, Robertshaw-Fulton Controls Co., 401 N. Manchester, Anaheim, Calif. Home: 12502 Del Rey Dr., Tustin, Calif.

WEHRLIN, RICHARD F., (m) President, Avion Division, ACF Industries, Inc., 299 State Highway #17, Paramus, N. J. Home: 108 E. 86th St., New York 28, N. Y.

WEIL, LESTER L., (m) Director, Chemistry Division, Atlantic Research Corp., 901 No. Columbus St., Alexandria, Va. Home: 11 West Glendale St., Alexandria, Va.

WEINBERG, ELLIOT K., Project Engr., Becco Chemical Division, Food Machinery & Chemical Corp., Station B, Buffalo 7, N. Y. Home: 132 Sterling Ave., Buffalo 16, N. Y.

WEINER, RICHARD S., (m) Test Engr., Experimental Rocket Eng. Test Lab., (F&R) AFFTC, Edwards AFB, Calif. Home: P. O. Box 524, Edwards, Calif.

WEINLAND, CLARENCE E., (m) Head, Applied Res. Div., U.S. Naval Ordnance Test Sta., China Lake, Calif. Home: 4-B Wasp Circle, China Lake, Calif.

WEINSTEIN, JACK J., (m) Aerodynamics Performance Engr., Special Defense Products Dept., General Electric Co., Schenectady, N. Y. Home: 50 Hanes St., Albany 3, N. Y.

WEIR, ALEXANDER, Jr., (m) Assoc. Research Engr., University of Michigan, Aircraft Prop. Lab., Willow Run Airport, Ypsilanti, Mich. Home: 1509 Ardmoor Dr., Ann Arbor, Mich.

WEIR, JOHN L., (m) Asst. Group Engr., Hayes Aircraft Corp., Birmingham, Ala. Home: 104 Oak St., Trussville, Ala.

WEISBERGER, HAROLD, (m) Technical Engr., Jet Eng. Dept., General Electric Co., Cincinnati 15, O. Home: 1722 Dale Rd., Cincinnati 37, O.

WEISE, CARL A., (m) Chief Power Plant Engr., Douglas Aircraft Co., Inc., Santa Monica, Calif. Home: 14231 Sunset Blvd., Pacific Palisades, Calif.

WEISENBERG, IRWIN J., (m) Sr. Proj. Engr., Development Div., Reaction Motors, Inc., Denville, N. J. Home: Lake Valley Rd., Morristown, N. J.

WEISS, MAURICE J., (s) Home: 1563 Inwood Ave., Bronx 52, N. Y.

WEISS, RICHARD S., (m) Chief Sales Engr., Avica Corporation, P. O. Box 180, Newport, R. I. Home: 42 Walnut St., Newport, R. I.

WEITZEL, WINFIELD, (m) Tech. Rep., Grand Central Rocket Co., Redlands, Calif. Home: 1335 - 14th St., N.W., Washington 5, D.C.

WELCH, CHESTER M., (m) Supervisory Electronics Engr., Chief-Communication & Instrumentation, White Sands Signal Corps Agency, White Sands, N. M. Home: 1001 Organ View Dr., Las Cruces, N. M.

WELCH, WILLIAM W., (m) Eng., Rocket Eng. Dept. AGT Div., General Electric Co., Evendale, O. Home: 4 Sheldon Close, Mariemont, Cincinnati 27, O.

WELLER, ALBERT E., JR., (m) Principal Engr., Battelle Institute, 505 King Ave., Columbus 1, O. Home: 1219 Eastview Ave., Columbus 12, O.

WELLS, WILLIAM D., (m) Vice Pres., New Development, International Map Co., Inc., 90 West St., New York 6, N. Y. Home: 189 Weaver Ave., Larchmont, N. Y.

WELLS, WILLIS L., (m) President, Geo. E. Wells, Inc., 918 S. Boyle Ave., St. Louis 10, Mo. Home: 433 Edgewood Drive, Clayton 24, Mo.

WELSH, JOHN C., (m) Gen. Mgr., The Christian Co., 3135 E. Foothill Blvd., Pasadena, Calif. Home 6907 - 10th Ave., Los Angeles, Calif.

WELTER, GORDON L., (s) V. P., Hydraulic & Marine Co., Intersection U. S. 81 & 2, Grand Forks, N. D. Home: 1632 Skidmore Ave., Grand Forks, N. D.

WENDT, CARL J., Jr., (m) Project Engr., USAF, Air Force Flight Test Center, Edwards AFB, Calif. Home: 618 S. Hobart Blvd., Los Angeles 5, Calif.

WENZEL, ROBERT F., (m) Sr. Thermodynamics Engr., Convair, A Division of General Dynamics Corp., Pomona, Calif. Home: 2340 Havenbrook St., W. Covina, Calif.

WERNER, JULIUS M., (m) Professor Mech. Engr., Syracuse Univ., Syracuse, N. Y. Home: 114 Henrietta St., E. Syracuse, N. Y.

WERRY, FREDERICK CHARLES, JR., (m) Mgr., Facilities Engng., Pan American World Airways, Guided Missile Range Div., AFMTC Patrick A.F. Base, Fla. Home: Star Rt. South, Merritt Is., Cocoa, Fla.

WESELIZA, MAURICE A., (s) Academy of Aeronautics, LaGuardia Airport, New York. Home: 353 W. 22nd St., New York 11, N. Y.

WESSELS, LEWIS J., (m) Group Engr. (Supr.), Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 8353 Melvin Ave., Northridge, Calif.

WEST, JULIAN M., (m) Director of Military Systems Engng., Military Electronics Dept., Bell Telephone Laboratories, Whippany, N. J. Home: 186 Boulevard, Mountain Lakes, N. J.

WEST, WILLIAM F., (s) Ordnance Corps., U.S. Army. Home: 805 South St., W. Lafayette, Ind.

WESTERHOLM, ROLAND J., (m) Sales Engr., New Products Div., Norton Company, 1 New Bond St., Worcester 6, Mass. Home: 5 Hockanum Way, Worcester 6, Mass.

WETTER, CHARLES R., (s) Engr., National Electronics, Inc., 628 North St., Geneva, Ill. Home: 528 Fulton St., Geneva, Ill.

WHALEN, PAUL G., (s) A Btry., 3d GM Bn (SSM), Fort Bliss, Tex. Home: 11 West Main St., Mannington, W. Va.

WHEATLEY, JOHN B., (m) Assist. Chem. Engr., Allison Div., General Motors, Indianapolis, Ind. Home: 5019 N. Meridian St., Indianapolis 8, Ind.

WHEATON, ELMER P., (m) Chief Proj. Engr., Missiles Div., Douglas Aircraft Co., Santa Monica, Calif. Home: 517 Bonhill Rd., Los Angeles 49, Calif.

WHEELER, JAMES W., (m) Director, Instrument Engng., Aeronautical Equipment Division, Sperry Gyroscope Co., Great Neck, L. I., N. Y. Home: 14 Highland Place, Sea Cliff, L. I., N. Y.

WHEELOCK, J. A., (a) President, J. Wheelock Associates, 2 W. 46th St., New York. Home: 18 Norman Pl., Tenafly, N. J.

WHEILDON, WILLIAM M., (m) Res. Engr., Res. & Develop., Norton Company, 1 New Bond, Worcester, Mass. Home: 84 Gates Ave., Framingham, Mass.

WHINERY, ROBERT O., (m) Structures Engr., Aerophysics Division, North American Aviation, Inc., Downey, Calif. Home: 827 East 46th, Long Beach, Calif.

WHIPPLE, G. GRAHAM, (m) Assistant Mgr., Liquid Eng. Div., Aerojet-General Corp., 6352 N. Irwindale Ave., Azusa, Calif. Home: 1925 Canyon Close Road, Pasadena, Calif.

WHITAKER, WILLIAM A., (m) Tulane University, Sta. 20, New Orleans 18, La. Home: Box 48, Tulane University, New Orleans 18, La.

WHITE, ETHNA A., (a) Secretary and Office Mgr., Haley, Doty & Wollenberg, 1735 DeSales St., N.W., Washington 6, D. C. Home: 3100 Connecticut Ave. N.W., Washington 8, D. C.

WHITE, GENE H., (m) Vice President, Admin., Frebank Co., 6441 San Fernando Rd., Glendale, Calif. Home: 15814 Gault St., Van Nuys, Calif.

WHITE, HERBERT M., (m) Chief Engr., Engng., U. S. Navy, BuAer Rep., c/o Aerojet-General Corp., Azusa, Calif. Home: 516 Morris Ave., West Covina, Calif.

WHITE, LEO D., (m) Mgr.-Proving Ground, Aircraft Gas Turbine Division, General Electric Co., P. O. Box 338, Peebles, Ohio

WHITE, ORVAL C., (a) Coordinator, Boeing Airplane Co., Patrick AFB, Melbourne, Fla. Home: 209 S. Ridgewood Ave., Daytona Beach, Fla.

WHITE, Z. LEWIS, (m) Proj. Engr., Philco Corp., 4700 Wissahickon Ave., Philadelphia 44, Pa. Home: 1472 Jericho Rd., Abington, Pa.

WHITE, NILES C., (m) Chief, Propellant Chemistry Section, Rocket Development Lab., Ordnance Missile Labs., Redstone Arsenal, Huntsville, Ala. Home: 523 Lowell Drive, Huntsville, Ala.

WHITE, RAYMOND E., Jr., (s) University of Illinois, Urbana, Ill. Home: 537 E. Franklin St., Lanmark, Ill.

WHITE, ROY, (m) Secy.-Treas., Rahm Instruments, Inc., 12 W. Broadway, New York, N. Y. Home: 86-75 Midland Parkway, New York 32, N. Y.

WHITE, WARREN A., (m) Tech. Representative, Aircraft Gas Turbines, General Electric Co., Middletown, O. Home: 1011 South Main St., Middletown, O.

WHITEHEAD, ROBERT F., (m) Tech. Engr., General Electric Co., A.G.T. Div., Evendale, Cinn. 15, O. Home: 2586 Bonnie Dr., Cincinnati, 30, O.

WHITTLESEY, DAVID W., (m) Sales Engng. Mgr., Western Division, Craig Systems, Inc., 6214 West Manchester Ave., Los Angeles 45, Calif. Home: 4115 Via Solano, Palos Verdes Estates, Calif.

WHITLEY, CHARLES M., (m) Washington Representative, Aerojet-General Corp., Azusa, Calif. Home: 926 Oakwood Dr., Falls Church, Va.

WHITLEY, ROBERT P., (m) Proj. Engr., U. S. Army Ordnance Corps, Redstone Arsenal, Huntsville, Ala. Home: RFD #2, Arab, Ala.

WHITLOCK, LARRY K., (s) Purdue University, Lafayette, Ind. Home: Box 1021, Cary Hall, W. Lafayette, Ind.

WIANT, WAYNE E., (m) Missile Specifications Engr., Aerophysics Department Goodyear Aircraft Corp., Akron, O. Home: 415 Aultman Ave. N.W., Canton 8, O.

WICHSER, ROBERT F., (a) Chief Research Engr., Republic Aviation Corp., Farmingdale, N. Y. Home: 3574 Amherst Dr., Wantagh, N. Y.

WICKERSHAM, ROBERT O., (m) Dept. Mgr., Military Sales Department, Missile Systems Div., Lockheed Aircraft Corp., 7701 Woodley Ave., Van Nuys, Calif. Home: 18050 Osborne St., Northridge, Calif.

WIDAWSKY, ARTHUR, (m) Engr.-Aerodynamics, Missile Develop. Division, North American Aviation, Inc., 12214 Lakewood Boulevard, Downey, Calif. Home: 703 S. Catalina St., Los Angeles 5, Calif.

WIEGAND, JAMES H., (m) Chairman, Dept. Chem. & Chem. Engng., Southwest Research Institute, 8500 Culebra Road, San Antonio 6, Tex. Home: 446 Furr Drive, San Antonio 1, Tex.

WIELAND, JOHN A., (m) Sr. Electronics Engr., Dept. 706 Convair, A Division of General Dynamics Corp., San Diego, Calif. Home: 2824 Chatsworth, San Diego 6, Calif.

WIENER, LEONARD S., (m) Chief Rocket Design Engr., Rocket Dept., Curtiss-Wright Corp., Caldwell, N. J. Home: 535 Standish Rd., Teaneck, N. J.

WIGERS, ALLAN B., (m) Electrical Engr., Engng., Ryan Aeronautical Co., 2701 Harbor Drive, San Diego, Calif. Home: 4543 Sauk, San Diego 17, Calif.

WIGGINS, JOSEPH W., (m) Chief Engr., Redstone Division, Thiokol Chemical Corp., Huntsville, Ala. Home: 120 Bibb Road, Huntsville, Ala.

WIGHTMAN, ROBERT R., (m) Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 4460 Hazeltine, Sherman Oaks, Calif.

WILBUR, PAUL C., (c) Director of Research & Vice Pres., Food Machinery & Chemical Corp., Box 760, San Jose 6, Calif. Home: 10445 Anderson Rd., San Jose, Calif.

WILFORD, DAVID B., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 20509 Schoenborn St., Canoga Park, Calif.

WILHITE, V. H. BRYCE, Chief Engr., Elkton Division, Thiokol Chemical Corp., Box 241, Elkton, Md. Home: 718 Swarthmore Drive, Newark, Dela.

WILKERSON, EMERY C., (m) Sr. Scientist, Propulsion Division, Experiment Incorporated, P. O. Box 1-T, Richmond 2, Va. Home: 5503 Forest Hill Ave., Richmond, Va.

WILLA, JAMES LEE, (a) Field Engr., Cooling Tower Inst., 444 Emerson St., Palo Alto, Calif. Home: 4810 Lido Lane, Houston 18, Tex.

WILLER, DAVID E., (s) Undergrad. Assist., Synclotron, Purdue University, 232 Cary Hall, Lafayette, Ind. Home: RR #3, Ft. Wayne, Ind.

WILLET, ROBERT M., Jr., (m) Engng. Planning Coordinator, Engng. Div., Bell Aircraft Corp., P. O. Box 1, Buffalo 5, N. Y. Home: 153 Walton Dr., Buffalo 21, N. Y.

WILLEY, NORMAN W., (m) Sr. Design Engr., Convair, A Division of General Dynamics Corps., San Diego, Calif. Home: 3130 First Ave., San Diego 3, Calif.

WILLIAMS, CHARLES W., (m) Mgr., Fabrication & Assembly, Missile Operations, Chrysler Corp., P. O. Box 2628, Detroit 31, Mich. Home: 1824 Pine St., Birmingham, Mich.

WILLIAMS, CLAYTON W., (m) Engr., Bell Aircraft Corp., Buffalo 5, N. Y. Home: 62 Fairbanks Ave., Kenmore 23, N. Y.

WILLIAMS, FORMAN A., (s) Calif. Inst. of Tech., Pasadena, Calif. Home: 3152 E. Colorado, Pasadena, Calif.

WILLIAMS, KIRK, (m) Fld. Engr. (Guidance) Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles, Calif. Home: c/o 96th Ord. Co., APO 185, New York, N. Y.

WILLIAMS, MARSHALL A., (a) General Sales Mgr., Govt. & Industrial Division, Philco Corp., 4700 Wissahickon Ave., Philadelphia, Pa. Home: 140 Willow Brook Rd., Huntingdon Valley, Pa.

WILLIAMS, MARY M., (m) Chem. Engr., Naval Ordnance Test Station, China Lake, Calif. Home: 50-B Rowe St., China Lake, Calif.

WILLIAMS, MAX L., Jr., (m) Associate Professor of Aeronautics, California Institute of Technology, 1201 E. Calif. St., Pasadena 4, Calif. Home: 409 Bonita Ave., Pasadena 10, Calif.

WILLIAMS, SEARS, (m) Assist. Proj. Engr., Prod. Design, Glenn L. Martin Co., Baltimore 3, Md. Home: 3309 Brendan Ave., Baltimore 13, Md.

WILLIAMSON, C. GLEN, (m) Executive Vice President, General Blower Co., 8600 Ferris Ave., Morton Grove, Ill. Home: 5831 Crain St., Morton Grove, Ill.

WILLIAMSON, JERRY L., (s) Parks College of Aeronautical Tech., East. St. Louis, Ill. Home: 811 Nelson Ave., E. St. Louis, Ill.

WILLIAMSON, ROBERT C., (m) Develop. Engr., Aircraft Gas Turbine Development Dept., General Electric Co., Cincinnati 15, O. Home: 24 Day Circle, M.R. #1, Milford, O.

WILLIAMSON, ROBERT H., (m) Airplane Design Engr., Temco Aircraft Corp., P. O. Box 6191, Dallas, Tex. Home: 1717 So. Edgefield Ave., Dallas 24, Tex.

WILLINSKI, MARTIN I., (a) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 18542 Sunburst St., Northridge, Calif.

WILLIS, CLIFFORD E., (m) Vice-President and General Mgr., National Water Lift Co., 2220 Palmer Avenue, Kalamazoo, Mich. Home: 1217 Franklin Circle, Kalamazoo, Mich.

WILLS, JERRY A., (s) New Mexico College A. & M.A., State College, New Mexico

WILLISTON, CARL O., (s) Diesel Electrician, C&O Railroad Co., Saginaw, Mich. Home: Route #4, Saginaw, Mich.

WILSON, EARL L., (m) Development Engr., Propulsion Section, JPL, Calif. Inst. of Tech., 4800 Oak Grove Dr., Pasadena 3, Calif. Home: 2227 Vandalia Ave., Los Angeles 32, Calif.

WILSON, E. MILTON, (m) Sr. Chemist, Chemical Dept., Aerojet-General Corp., Box 296, Azusa, Calif. Home: 1216 Sunny Oak Circle, Altadena, Calif.

WILSON, JOHN E., (a) District Mgr. & Met. Engr., Development-Sales, Climax Molybdenum Co., 650 S. Grand, Los Angeles 17, Calif.

WILSON, JOHN R., (m) President, Hanlon & Wilson Co., 321 Pennwood Ave., Pittsburgh 21, Pa. Home: 1021 Jefferson Hts., Pittsburgh 35, Pa.

WILSON, ROBERT D., (m) Ground Test Group, Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif.

WILSON, ROBERT W., (m) Project Engr., Advanced Development Div., Avco Mfg. Corp., 12 Sniffen's Lane, Stratford, Conn. Home: 424 Wood End Rd., Stratford, Conn.

WILSON, WARREN K., (a) Research Chemist, Goodyear Tire & Rubber Co., Akron, O. Home: 1272 Pondview Ave., Akron 5, O.

WIMPRESS, DONALD S., (m) Devel. Engr., AiResearch Mfg. Co., 9851 Sepulveda Blvd., Los Angeles, Calif. Home: 9307 Ingleport Ave., Los Angeles 45, Calif.

WINCHESTER, WILLIAM G., (s) Indiana Technical College, Inc., 221-223 East Washington Blvd., Fort Wayne, Ind. Home: 170 West Second St., Roanoke, Ind.

WING, GEORGE SHERMAN, (m) Project Engr., Research Division, Curtiss-Wright Corp., Brighton Rd., Clifton, N. J. Home: 282 N. Fullerton Ave., Montclair, N. J.

WINKLER, LEOPOLD, (m) Mech. Engr., Naval Research Lab., Washington 25, D. C. Home: 4629 Clark Pl., Washington, D. C.

WINSTON, HERBERT, (s) Yale University, Sterling Hall of Medicine, 333 Cedar St., New Haven, Conn. Home: 102-47 - 65th Road, Forest Hills 75, New York

WINTER, FINTON J., Jr., (s) Parks College, E. St. Louis, Ill. Home: France Ave., Minneapolis, Minn.

WINTER, JOHN S., (m) Chief Engr., Powerplants Subdivision, Marquardt Aircraft Co., 16555 Saticoy St., Van Nuys, Calif. Home: 17412 Hart St., Van Nuys, Calif.

WINTER, HENRY F., (s) Case Inst. of Technology, Box 269, Case Dorm., Cleveland 6, O. Home: 351 Elm Dr., Wooster, O.

WINTERNITZ, PAUL F., (m) Res. Prof. of Chem. Engng., N.Y.U., University Heights, New York 53, N. Y. Home: 166 W. 72nd St., New York 23, N. Y.

WISE, EUGENE P., (m) Staff Proj. Engr., Chrysler Corp., Missile Br., P. O. Box 2628, Detroit 31, Mich. Home: 3225 Thomas, Berkley, Mich.

WISS, JOHN W., (m) U. S. Army Ordnance, WS.P.G., N. Mex. Home: 1339 Lincoln Rd., Columbus, O.

WITHERSPOON, JAMES D., (s) Lab. of Animal Physiology, Purdue University, W. Lafayette, Ind. Home: 115 Waldron, W. Lafayette, Ind.

WITHEY, JAMES T., (m) Project Engr., Defense Products, M. W. Kellogg Co., Jersey City, N. J. Home: 75 Prospect St., Little Falls, N. J.

WITKO, JOSEPH, Jr., (m) Engr., Project Engng., Reaction Motors, Inc., Denville, N. J. Home: Longwood Rd., R.D. #1, Wharton, N. J.

WITTGEN, JACK, (m) Superintendent, Plant Control, Aerojet-General Corporation, 6352 N. Irwindale Ave., Azusa, Calif. Home: 666 Forest Ave., South Pasadena, Calif.

WOIE, ARDELL H., (m) USAF, Mechanic-Aircraft & Engine, McChord A.F.B. Washington. Home: 523 North C., Tacoma 3, Wash.

WOLF, JOHN WILLIAM, (a) Sr. Armament Engr., Armament Div., Glenn L. Martin Co., Baltimore, Md. Home: 5700 Cross Country Blvd., Baltimore 9, Md.

WOLF, HELMUT, (s) Research Asst., Purdue University, Rocket Lab., W. Lafayette, Ind. Home: 21 University St., W. Lafayette, Ind.

WOLF, ROBERT L., (m) Vice-President, Propulsion Division, Experiment Incorporated, P. O. Box 1-T, Richmond 2, Va. Home: Route 2, Box 140, Chesterfield, Va.

WOLFE, ALLEN E., (m) Res. Engr., Instrument Develop. Section, Jet Propulsion Laboratory, Calif. Inst. of Technology, 4800 Oak Grove, Pasadena 3, Calif. Home: 2980 Crestford Dr., Altadena, Calif.

WOLFE, GIBSON M., (m) Systems Engr., Proj. 8014 L.M.E.E.D., General Electric Co., French Road, Utica, N. Y. Home: 1611 Sherman Dr., Utica, N. Y.

WOLFF, HENRY, (m) Development Engr., Proving Grounds, Aerojet-General Corp., Azusa, Calif. Home: 1150 Daveric Dr., Pasadena 8, Calif.

WOLFF, FRED L., (a) Aeronautical, Astronautical Illustrator. Home: 107 Michigan Ave., Kenilworth, N. J.

WOOD, CARLOS C., (m) Chief Engr., Douglas Aircraft Co., Inc., 3855 Lakewood Blvd., Long Beach 1, Calif. Home: 1721 Camino de la Costa, Redondo Beach, Calif.

WOOD, JOSEPH H., Jr., (m) Civil Engr., Test Engng. Branch, Experimental Rocket Engine Test Lab., Edwards Air Force Base, Calif. Home: 9826-E Ave. J, Lancaster, Calif.

WOOD, LYSLE A., (m) Vice President and General Mgr., Pilotless Aricraft Division, Boeing Airplane Co., Seattle 14, Wash. Home: 6044 Upland Terrace, Seattle 18, Wash.

WOOD, Norman E., (m) Structures Engr., Res. & Develop. Lab., 9236 E. Hall Road, Downey, Calif. Home: 7856 Lyndora, Downey, Calif.

WOODS, KENNETH P., (m) Design Engr., Convair, A Division of General Dynamics Corp., Pomona, Calif. Home: 9160 Huntington Dr., San Gabriel, Calif.

WOODS, ROBERT O., (s) Mech. Designer, Allstates Engineering Co., 25 N. Warren St., Trenton, N. J. Home: 64 Dunmore Ave., Trenton, N. J.

WOODWARD, HARPER, (m) Aviation Adviser to Laurance S. Rockefeller, 30 Rockefeller Plaza, Room 5600, New York 20, N. Y. Home: Holly Lane, Rye, N. Y.

WOOLDRIDGE, ROY D., (s) Indiana Technical College, 221 East Washington Blvd., Ft. Wayne, Ind. Home: 2221 South Calhoun, Ft. Wayne, Ind.

WOOSTER, JOHN J., (a) Physician, Home: 106 North Dr., San Antonio, Tex.

WOOTEN, GUY G., (s) Lt. USN, Naval Aviator, Maintenance Officer, Fighter Squadron 174, U. S. Navy, NAS Cecil Field, Jacksonville, Fla. Home: 4119 Tyndale Dr., Jacksonville 10, Fla.

WORLEY, JOHN B., (s) Ohio State University, Columbus 10, O. Home: 47 E. Woodruff Ave., Columbus, O.

WORSHAM, JAMES E., (a) Development Engr., AGT Div., General Electric Co., Bldg. 300, Cincinnati 15, O. Home: 519 W. Kemper Rd., Glendale, O.

WORTH, WELDON, (f) Chief, Plans & Analysis, Power Plant Lab., Wright-Patterson Air Force Base, Dayton, O. Home: 39 Hadley Rd., Dayton 9, O.

WOTT, HAROLD W., (a) Radar Technician, Depot Maintenance, Erie Ordnance Depot, Port Clinton, O. Home: 545 No. Locust St., Oak Harbor, O.

WREDE, DON E., (m) Quality Assurance Inspector, General Electric Co., AGT Div., Lockland Highway, Cincinnati 15, O. Home: 6812 Vine St., Cincinnati 16, O.

WRIGHT, F. HAMILTON, (m) Sr. Res. Engr., Jet Propulsion Lab., Cal. Inst. of Technology, Pasadena, Calif. Home: 4313 Alta Canyada Rd., La Canada, Calif.

WRIGHT, HAROLD V., (m) Captain USAF, Instructor in Senior Observor Technical Specialist School, USAF, Mather Air Force Base, Mather Field, Calif. Home: Box 4062 Mather AFB, Mather Field, Calif.

WRIGHT, HOWARD R., JR., (m) Performance Analysis Engr., Guided Missiles Range Div., Pan American World Airways, Patrick AFB, Fla. Home: 23-B Riverside Dr., Patrick AFB, Fla.

WRIGHT, JOHN B., (s) Test Design Engr., Component Dev., Aircraft Gas Turbine Division, General Electric Co., Evendale, O. Home: 4010 Pleasant Ave., Hamilton, O.

WRIGHT, JOHN R., (m) Project Engr., AFMTC Firing System, Systems Engng., RCA Service Co., Patrick AFB, Fla. Home: 135 Cocoa Place, Cocoa, Fla.

WRIGHT, WILLIAM F., (m) Staff Engr., New Design Dept., Lockheed, Missiles Division, 7701 Woodley, Van Nuys, Calif. Home: 20537 Schoenborn, Canoga Park, Calif.

WRIGLEY, WALTER, (m) Deputy Director; Associate Professor, Instrumentation Lab.; Dept. of Aero. Eng., Mass. Institute of Technology, 68 Albany St., Cambridge 39, Mass. Home: 93 Grand View Ave., Wollaston 70, Mass.

WROTEN, WILLIAM L., JR., (m) Sr. Engr. Tech. Services, Refractory Div., The Carborundum Co., Perth Amboy, N. J. Home: 155 Vinton Circle, Fanwood, N. J.

WUNCH, WILLIAM S., (m) Res. Specialist, Aerodynamics Department, Lockheed Missile Systems Division, 7701 Woodley Ave., Van Nuys, Calif. Home: 246 Notteargenta Rd., Pacific Palisades, Calif.

WYND, LEO F., (m) Sr. Rocket Components Test Engr., Bell Aircraft Corp., Engng. Div., Buffalo 5, N. Y. Home: 523 Montrose Ave., Kenmore 23, N. Y.

Y

YACHTER, M., (m) Sr. Engr. Devel. Div., M. W. Kellogg Co., 225 Broadway, New York, N. Y. Home: 43 W. 88th St, New York 24, N. Y.

YAGI, FUMIO, (m) Mathematician, Ballistic Research Labs., Aberdeen Proving Ground, Md. Home: 105 D. Rodman Rd., Aberdeen, Md.

YANCULEFF, CORNELIA, (a) Artist-Cartographer, Goodyear Aircraft Corp., Massillon Rd., Akron, O. Home: 843 Packard Dr., Akron 20, O.

YANOW, GILBERT, (s) UCLA, Westwood, Calif. Home: 3209 Tareco Dr., Hollywood 28, Calif.

YAPLEE, ALLEN S., (m) Research Engineer, Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 22803 Dolorosa St., Woodland Hills, Calif.

YASECKO, JOSEPH S., (m) Supervisory Engineer, Patrick Air Force Base, Fla. Home: Box 195, Rt. 1, Melbourne, Fla.

YATES, DONALD N., (m) Major General, USAF, Commander, AFMTC, Air Research and Development Command, Patrick AFB, Fla. Home: Box "A", OMU, Patrick AFB, Fla.

YEE, DICKMAN, (m) Design Engr., McDonnell Aircraft Corp., Box 516, St. Louis, Mo. Home: 4372 Laclede Ave., St. Louis, Mo.

YEE, THEODORE S. H., (m) Res. Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 6900 Claire Ave., Reseda, Calif.

YEH, HSUAN, (m) Associate Professor, Dept. of Mechanical Engineering, The Johns Hopkins University, Baltimore 18, Md. Home: 1033 Evesham Ave., Baltimore 12, Md.

YESH, FRANK K. (s), USA, 56th Signal Company (REP), Ft. Huachuca, Ariz. Home: 3330 McKinley, Dearborn, Mich.

YIH, WEI HUNG, (a) Mechanical Engineering, Designer, W. T. Howald Machine Works, 182-186 Sigourney St., Brooklyn, N. Y. Home: 181-30 Dalny Rd., Jamaica, L. I., N. Y.

YOB, PARRY C., (m) Chemist, Solid Prop. Devel., Aerojet-General, Corp., Irwindale Ave., Azusa, Calif. Home: 423 North Bender, Glendora, Calif.

YORDY, RICHARD L., (m) Base Manager, Cape Canaveral Aux. AFB, Guided Missile Range Div., Pan American World Airways, Inc., P. O. Box OMU-308, Patrick AFB, Fla. Home: 136 Grimes St., Cocoa, Fla.

YORK, HARRY J., (m) Dev. Engr., Aerojet-General Corp., P. O. Box 1947, Sacramento, Calif. Home: 2403 Meadowbrook Rd., Sacramento 31, Calif.

YOUNG, DAVID A., (m) Principle Engr., Product Development, Aerojet-General Corp., Azusa, Calif. Home: 610 E. Foothill, Glendora, Calif.

YOUNG, EDWARD J., (m) Chief, Missiles Records, Release & Reproduction Section, Missiles Engng. Dept., Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. Home: 2520 Pearl St., Santa Monica, Calif.

YOUNG, KENNETH B., (m) Chief Materials Engr., Orenda Engines, Ltd., Box 4015, Terminal "A", Toronto, Ont., Canada. Home: 78 Greenbrook Dr., Toronto 9, Ont., Canada.

YOUNG, P. ROBERT, (m) Chief Plastics Engr., Engng., East Coast Aeronautics, Inc., 10 Pelham Pkwy., Pelham Manor, N. Y. Home: 308 Melbourne Ave., Mamaroneck, N. Y.

YOUNG, RAYMOND W., (m) President, Reaction Motors, Inc., Ford Rd., Denville, N. J. Home: Wearimus Rd., P. O. Box 85, Hohokus, N. J.

YOUNG, RICHARD H., (m) Research Engr., Dept. 596, Group 62, Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 22262 Vanowen St., Canoga Park, Calif.

YOUNG, ROBERT B., (m) Resident Manager, Liquid Rocket Plant, Aerojet-General Corporation, P. O. Box 1947, Sacramento, Calif. Home: 3691 Fair Oak Bldg., Sacramento 25, Calif.

YOUNG, STANISLAUS K. P., (s) Univ. of Illinois, 909 W. Springfield Ave., Urbana, Ill. Home: P. O. Box 503, Sta. A., Champaign, Ill.

YOUNG, WILLIAM J. (m) Tool Engr. "B", Boeing Airplane Co., Wichita, Kan. Home: 410 S. Oliver, Wichita, Kan.

YOUNGQUIST, JOHN R., (m) Chief Engr., Glenn L. Martin Co., Denver, Colo.

YOUNGQUIST, ROBERTSON, (m) Chief of Applied Research & Compon. Devel., Engng. & Research Div., Reaction Motors, Inc., Denville, N. J. Home: 61 Washington Ave., Morristown, N. J.

YOUTCHEFF, JOHN SHELDON, (m) Physicist, Operations Research Unit, General Electric Company, Advanced Electronics Center, Ithaca, N. Y. Home: Eastwood Terrace, (P. O. Box 96), Ithaca, N. Y.

YUEN, JOSEPH N., (a) Electronic Technician, Project Vanguard, Naval Research Lab., Washington 25, D. C. Home: 515 Hilltop Ter., S.E., Washington 19, D. C.

YUSI, RAMON J., JR., (s) Home: 12 Grove St., Port Chester, N. Y.

Z

ZABEL, PATRICK H., (m) Test Engr., Rocketdyne, A Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif. Home: 20200 Devonshire Blvd., Chatsworth, Calif.

ZABIELSKI, CHESTER V., (m) Research Fellow, Rensselaer Polytechnic Institute, Troy, N. Y. Home: 25 Monroe St., Schenectady 4, N. Y.

ZADEL, ANTON J., (s) Indiana Tech. College, 221 E. Washington Blvd., F. Wayne, Ind. Home: 3410 S. Calhoun, Ft. Wayne, Ind.

ZAEHRINGER, ALFRED J., (m) President, American Rocket Company, Box 1112, Wyandotte, Mich. Home: 9424 Allen Rd., Allen Park, Mich.

ZAHN, HERMAN S., JR., (m) Sr. Engr., Electro-Mechanical Dept., Eng. Div., Glenn L. Martin Co., Baltimore, Md. Home: 9106 Yvonne Ave., Baltimore 6, Md.

ZAMBO, STEVE P., JR., (s) Purdue University, Lafayette, Ind. Home: 10120 Kennedy Ave., Highland, Ind.

ZAK, STANLEY J., (m) Engng. Mgr., The Greenleaf Manufacturing Co., St. Louis 17, Mo. Home: 5 Blaytonn Lane, Ladue 17, Mo.

ZANNES, TOMMIE, (m) Sr. Test Engr., Bell Aircraft Corp., Rocket Lab., Niagara Falls, N. Y. Home: 335 Louraine Dr., Kenmore 23, N. Y.

ZAPPA, ROBERT FRANCIS, (s) Aeronautical Research Scientist, Supersonic Propulsion, NACA, Lewis Flight Propulsion Lab., Brookpark Rd., Cleveland, O. Home: 17421 Fernshaw Ave., Cleveland 11, O.

ZAREM, ABE M., (m) Owner, A. M. Zarem & Associates, 727 West Seventh St., Los Angeles 17, Calif. Home: 2325 Monte Vista, Pasadena 8, Calif.

ZEBROWSKI, EDWARD A., (m) Physicist, Engng. Div., U. S. Army, WSPG, New Mex. Home: 1511 Boutz Rd., Las Cruces, New Mex.

ZEBROWSKI, WALTER J., JR., (m) General Representative, Convair, A Division of General Dynamics, Ft. Worth, Tex. Home: 253 Villa Ave., Buffalo 23, N. Y.

ZEBROWSKI, WALTER S., (m) Operations Engr., Wind Tunnel Dept., Cornell Aeronautical Laboratory, 4455 Genesee St., Buffalo, N. Y. Home: 59 Lisbon Ave., Buffalo 14, N. Y.

ZEHETNER, HOWARD, (m) Propulsion Research Analyst, North American Aviation, Inc., Los Angeles, Calif. Home: Malibu Lake Star Rte., Agoura, Calif.

ZEIGER, MARCUS A., (m) Aero. Mech. VII, NACA, Ames Aero. Lab., Moffet Field, Calif. Home: 65 Rosemary St., San Jose, Calif.

ZENGEL, JOHN F. P., (m) Captain, Research Directorate, Special Weapons Center, Kirtland AFB, Albuquerque, N. M. Home: 3820 Simms Ave., S.E., Albuquerque, N. M.

ZERBEY, JOHN F. III, (m) Plant Engng. - Gen. Supervisor, Missile Operations, Chrysler Corp., P. O. Box 2628, Detroit 31, Mich., Home: 1323 Stanley Blvd., Birmingham, Mich.

ZETTLE, DENNIS E., (m) Home: 1213 Penn Ave., New Brighton, Pa.

ZIEMER, RICHARD W., (s) Research Fellow, Northwestern University, Evanston, Ill. Home: 3041 N. Natchez Ave., Chicago 34, Ill.

ZIMMERER, ROBERT W., (a) University of Colorado, Boulder, Colo. Home: 819 14th St., Boulder, Colo.

ZIMMERMAN, JACK M., (m) Research Engr., Rocketdyne, A Division of North American Aviation, Inc., Canoga Park, Calif. Home: 5533 Shoup Ave., Woodland Hills, Calif.

ZIMMERMAN, JOHN H., (m) Br. Develop. and Engng. Service, Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y. Home: Saugatuck Shores, So. Norwalk, Conn.

ZIMMERMAN, PETER, (s) Home: 7702 Pennsylvania Pl. N.E., Albuquerque, N. M.

ZIMNEY, CHARLES M., (m) Chief Engr., Horning-Cooper, Inc., 2626 So. Peck Rd., Monrovia, Calif. Home: 985 Crestview Dr., Pasadena 8, Calif.

ZIPKIN, MORRIS A., (m) Chief Thermodynamicist, Aerophysics, Goodyear Aircraft Corp., Akron 15, O. Home: 904 Hartford Ave., Akron 20, O.

ZOIKE, HELMUT M., (m) Staff Specialist, Engng. Dept., Servomechanisms, Inc., 12500 Ashton Blvd., Hawthorne, Calif. Home: 254 Via Linda Vista, Redondo Beach, Calif.

ZOLA, JOHN C., (m) Director, John C. Zola Laboratories, 409 So. Raymond Ave., Alhambra, Calif. Home: 2662 10th Ave., Arcadia, Calif.

ZOLLINGER, JOE E., (s) Capt. USAF, Project Engineer F-86F/H a/c Air Research & Development Command, United States Air Force, Box 7663, Wright-Patterson AFB, O. Home: 518 Lohnes Dr., Fairborn, O.

ZUBKO, LEONARD M., (m) Manager, AGT Development Dept., General Electric Co., Bldg. 300, Cincinnati 15, O. Home: 183 Farragut Rd., Greenhills, Cincinnati, O.

ZUCROW, MAURICE J., (f) Professor of Gas Turbine & Jet Propulsion, Purdue University, School of Mechanical Engineering, W. Lafayette, Ind. Home: 801 Carrolton Blvd., W. Lafayette, Ind.

ZUKOSKI, EDWARD E., (m) Res. Engr., Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena, Calif. Home: 467-A South El Malino, Pasadena, Calif.

ZWEMER, HOWARD A., Development Planning Specialist, Development Planning Department, Lockheed Aircraft Corporation, Burbank, Calif. Home: 736 Lynnhaven Lane, La Canada, Calif.

ZWICKY, FRITZ, (f) Professor of Astrophysics, California Institute of Technology, Pasadena 4, Calif. Home: 2065 Oakdale St., Pasadena, Calif.

ADDENDA*

Anderson, Robert C.
701-B Nimitz Ave., China Lake, Calif.

Bader, Hugh R., Jr.
112 Stuart, Ft. Collins, Colo.

Barlow, Melville R.
3539 Luna Ave., San Diego 17, Calif.

Barnes, Samuel E., General Electric Co.
Marketing Service Training School, Evendale, O.

Barr, Claude James, Olin Mathieson Chemical Corp.
E. Alton, Ill.

Borkan, Jacob D.
602 Highland Ave., Kenmore 23, N. Y.

Bruski, Edmund
3689—4th Ave., San Diego, Calif.

Burch, Jackie J.
Rt. 3, Box 72, Arlington, Texas

Camper, Benton B.
3336B So. Wakefield St., Arlington, Va.

Cates, C. Douglas
5330 Cochin Ave., Arcadia, Calif.

Cohan, Henry
3504 Carlsbad Way, Riverside, Calif.

Cornell, Leslie A., Reeves Instrument Corp.
Roosevelt Field, Mineola, N. Y.

Coulter, Donald E., Indiana Technical College
223 E. Washington Blvd., Ft. Wayne, Ind.

Csanady, Elmer R.
100 Tecumseh Drive, Forest Heights, Md.

Clark, Donald H.
4656 Plantation Ave., Fair Oaks, Calif.

Clingingsmith, Thomas W.
Parks College of St. Louis Univ., East St. Louis, Ill.

D'Arcy, Robert W.
716 S. Second Ave., Arcadia, Calif.

Dawson, Stanley R.
1717 Lansing Rd., Harundale, Glen Burnie, Md.

DeVivo, Anthony J.
388 Fulton Ave., Jersey City 5, N. J.

Drozdziel, Marion J.
152 Linwood Ave., Tonawanda, N. Y.

Dunkle, Cyrus G.
15 Fairchild Ave., Morris Plains, N. J.

Fero, Lester K.
19 Woodgate Rd., Tonawanda, N. Y.

Farrar, I. M., Jr.
1004 Bragg Circle, Tullahoma, Tenn.

Fauster, Kenneth B.
513 Third Ave., West Bend, Wisc.

Geffs, Robert C.
900 Fallen Leaf Rd., Arcadia, Calif.

Gerlach, Alan M.
10 Roberts Rd., Wellesley 82, Mass.

Graham, James A., Cambridge Corporation
Industrial Park, Lowell, Mass.

Green, Joseph F.
2959 East 27th, Tucson, Ariz.

Gulick, Edwin C., Philco Corporation, Govt. and Industrial Div.
10589 Santa Monica Blvd., Los Angeles 25, Calif.

Gustavson, John
3290 Harbor View Dr., San Diego 6, Calif.

Guy, Charles W.
17230 Sunburst St., Northridge, Calif.

Haggard, Leroy E.
2750 Kendall, Detroit 38, Mich.

Harp, James L.
Battelle Memorial Institute, Columbus, O.

Hartel, Charles F., Jr., Aerophysics Development Corp.
506 Santa Monica Blvd., Santa Monica, Calif.

Hartzell, Wilbur G.
711 Linda Vista Ave., Redlands, Calif.

Havrylak, Joseph
19028 Hollyvale St., Glendora, Calif.

Hennessy, John C.
Box 71A, Route 3, Wayzata, Minn.

Hinkley, Edward T.
1224 Thornden Rd., Rockville, Md.

Houghton, Richard B.
4231 Hill St., San Diego 7, Calif.

Howard, John M.
Aerojet-General Corp., Azusa, Calif.

Howard, Wilmer S.
6132 Main Ave., Orangevale, Calif.

Huffman, William E., Jr.
5858 Schuyler St., San Diego 14, Calif.

Hybiak, Walter J.
4019 West 57th Place, Chicago 29, Ill.

Jackson, Charles H., Jr.
813 N. Cordova St., Burbank, Calif.

Jones, George P., Jr.
Geophysics Research Directorate, Boston, Mass.

Kalet, Milton W.
210 Congress St., Brooklyn 1, N. Y.

Kendall, Donald E.
1529 Granville Ave., Los Angeles 25, Calif.

Kernott, Robert P.
1520 N. Crescent Hts. Blvd., Los Angeles 46, Calif.

Kidwell, Norman E.
P. O. Box 1628, Springfield, Mass.

Kinack, Ronald J.
15831 Littlefield, Detroit, Mich.

Krase, William H.
R. #2, Morow, O.

Kruszynski, Norbert E., United States Army
"D" Btry. 74th AAA, Bn., Pittsburgh 29, Pa.

Kuryla, William C.
1652—23rd St., Cuyahoga Falls, O.

Ladesich, John
3518 W. 73rd Terrace, Kansas City 13, Mo.

LeFrois, Robert G.
309 State St., Medina, N. Y.

Lewis, Sydney W.
330 E. Hazel St., Apt. 6, Inglewood, Calif.

Lightfoot, Jackson K.
Powder Power Tool Corp., Portland, Ore.

Lockwood, Robert M., Lockwood, Andrews & Newman
P. O. Box 13 332 (1010 Waugh Drive), Houston 19, Texas

Logan, John W., Cambridge Corp.
Industrial Park, Lowell, Mass.

Loomis, William W.
303 South Lee St., Garrett, Ind.

Marion, Frank A.
615 Orchard Dr., Redlands, Calif.

Mathewson, Bruce W.
483 Clifton Ave., Clifton, N. J.

Meyer, Robert T.
4543 Crown Ave., La Canada, Calif.

Minzner, Raymond A.
7 Oak Hill Dr., Arlington 74, Mass.

Monjar, Vernon
1404 Thomas Dr., Las Cruces, N. M.

Moule, James C.
2345 Oak St., Apt. #2, Santa Monica, Calif.

Murray, Francis J.
3815 Countryside Plaza, Wichita 17, Kansas

Nathan, Robert L., Coleman Engineering Co., Inc.
6040 W. Jefferson Blvd., Los Angeles 16, Calif.

O'Mahoney, William
4905 W. Van Buren, Chicago, Ill.

Newman, David P.
60-A Franklin, China Lake, Calif.

Pasquariello, John R.
R. R. #1, Box 22, Osceola, Ind.

Pellonini, David F.
4748 Donovan Dr., Carmichael, Calif.

Plummer, Ira Lee
1/Lt. USAF, 1280 AACSRON, APO 241, N. Y.

Ragsdale, William C.
Purdue University, W. Lafayette, Ind.

Reinhardt, Charles M.
9950 Lanier, St. Louis 21, Mo.

Reynolds, Francis D.
4214—28th Place, W., Seattle 99, Wash.

Reynolds, Richard S.
Box 133, Monterey, Calif.

Riebeschl, Edward
Oak Grove Trailer Court, New Brighton, Minn.

Rogers, Joseph W.
511 S.W. 4th Ave. (Apt. #5), Miami 36, Fla.

Ross, Herman H., Jr.
Potter Pacific, Woodland Hills, Calif.

Salter, James W.
3910 Gannon Rd., Silver Spring, Md.

Samuels, James L.
240 N. Topeka, Apt. 203, Wichita 2, Kansas

Sartore, Silvio R.
1403 Ivyton St., Lancaster, Calif.

Schmidt, F. Robert
Naval Research Lab., Washington, D. C.

Schnitt, Arthur
11 Linwood Ave., Buffalo 2, N. Y.

Seeman, Richard V.
121 Rodney Ave., New Brunswick, N. J.

Seitz, Robert N.
96 Stockbridge Rd., Mentor, O.

Senneff, John M.
381 Claremont Ave., Kenmore 23, N. Y.

Sheppard, Donald C.
3900 Old Powdermill Rd., Beltsville, Mo.

Spitler, James K., Indiana Technical College
221 E. Washington Blvd., Ft. Wayne, Ind.

Still, C. Henry
Rocky Mountain News, Denver, Colo.

Stillwell, Charles E.
3947½ E. Bellevue Ave., Tucson, Ariz.

Szaniszlo, Andrew J.
4175 E. 142nd St., Cleveland 28, O.

Tait, Charles W.
Wyandotte Chemicals Corp., Wyandotte, Mich.

Thatch, Daymon W.
421 Magnolia St., Highland Park, N. J.

Thompson, Allen W.
Hq. Air Force Flight Test Center, ARDC, Edwards AFB, Calif.

Towne, Fred T., III
4049 Prescott, Dallas, Texas

Turek, Charles
251 Northwood Dr., Kenmore 17, N. Y.

Turner, John J.
60-A Franklin, China Lake, Calif.

Van Emon, Clair E., Ramo-Wooldridge Corporation,
5730 Arbor Vitae St., Los Angeles 45, Calif.

Waldo, Robert D.
Aerojet-General Corp., Azusa, Calif.

Wang, Chiao-Jen
922 E. Imperial Highway, El Segundo, Calif.

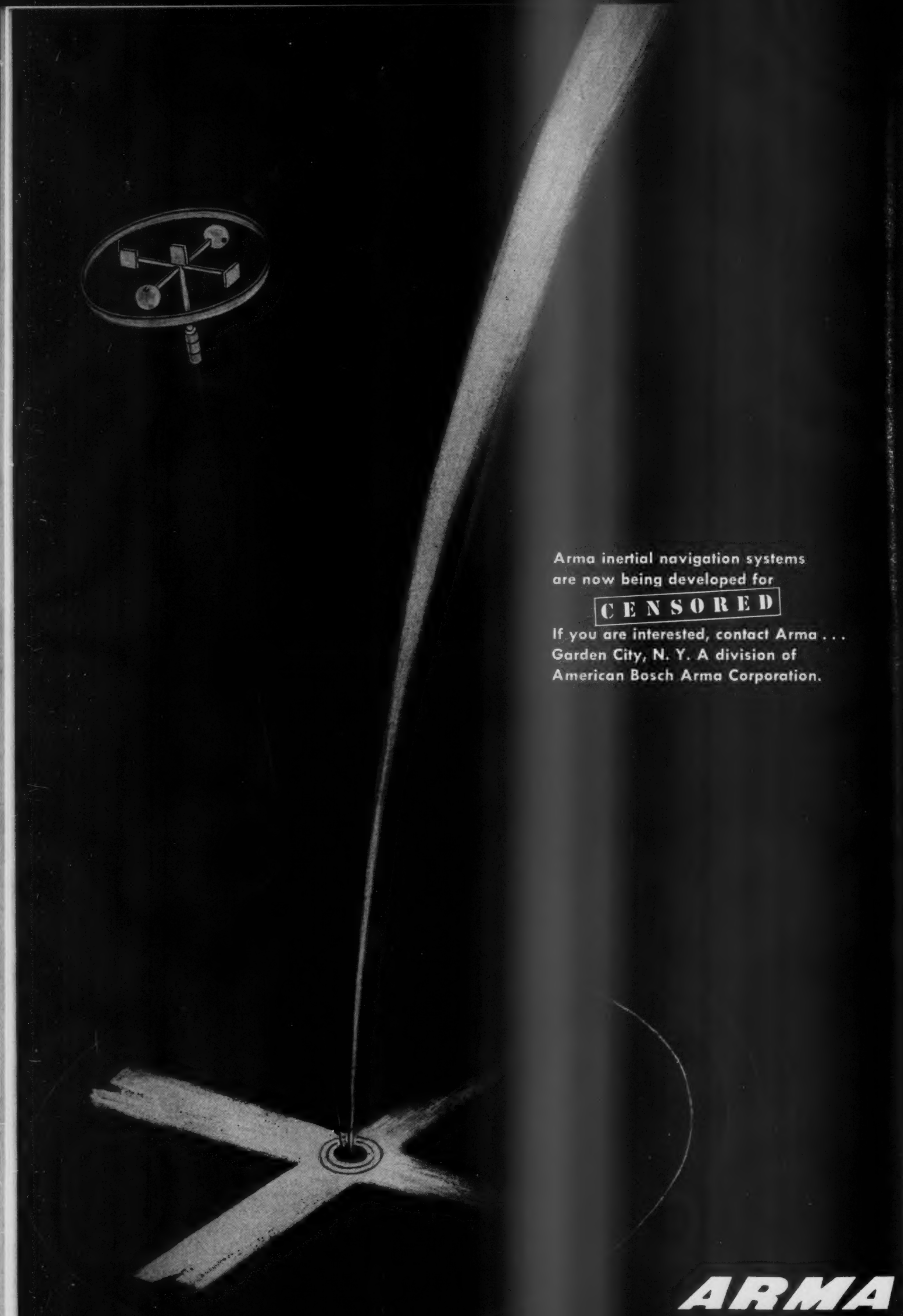
Weber, William P.
Battelle Institute, Columbus, O.

Welther, Robert S.
2216 Marine St., Santa Monica, Calif.

Wyckoff, Peter H.
155 Washington Ave., West Newton, Mass.

---

* Members processed after Roster closing date.


Arma inertial navigation systems
are now being developed for
CENSORED
If you are interested, contact Arma . . .
Garden City, N. Y. A division of
American Bosch Arma Corporation.
ARMA

COMPANY LIST

ACF INDUSTRIES, INC.
NEW YORK, N. Y.

Etherington, Harold, Vice President
Furrer, R., Vice President
Reid, J. G., Jr., General Mgr.
Viklund, Vidar, Mechanical Engr.

Avion Division, Paramus, N. J.
Maloney, William W., Jr., Draftsman
Wehrlin, Richard F., President

Erco Division, Hyattsville, Md.
Dorris, Homer L., Designer "A"
Foster, Victor W., Development Engr.
Martucci, Anthony R., Designer
Vaught, William A., Mech. Designer

St. Charles, Mo.
Raiche, Louis G., Mgr., Aircraft

ACCESSORY PRODUCTS CORP.,
WHITTIER, CALIF.

Adair, George P., Sr. Partner, Chief Engr.
Cordes, Orville A., Sales Mgr.
Durning, William P., Sales Promotion Mgr.
Eguiazu, Pedro Miguel, Maintenance Eng.
Maple, Robert L., Executive V. Pres.
Ransom, Eugene A., Factory Mgr.
Rogers, Robert G., President
Smith, William M., V. P. & Chief Engr.
Taylor, William P., Proj. Engr.

AERO ENGINEERING CO.
MINEOLA, N. Y.

Granlund, Karl G., Installation Engr.

AEROJET-GENERAL CORP., AZUSA, CALIF.
Apodaca, Albert R., Proj. Engr.
Apolis, John J., Design Engr.
Armstrong, Aikman Jr., Engng. Rep.
Armstrong, Don L., Director Chem. Dept.
Barney, John D., Design Engr.
Beattie, Richard M., Sr. Engr.
Beauchamp, Jack M., Northeastern Reg. Rep.
Billheimer, John S., Devel. Engr.
Blatz, Paul J., Tech. Specialist
Bloom, William E., Leadman
Bosco, George B., Jr., Head, Rotating Machinery Dept
Bradshaw, Samuel L., Tech. Editor
Brittain, Charles W., Design Engr.
Bross, David R., Rocket Controls Devel. Engr.
Brower, Jack M., Design Engr. "A"
Brown, Clyde O., Senior Chemist
Brown, Robert C., Patent Counsel
Bruns, August F., Regional Rep.
Burton, Boxenhorn, Design Engr. "B"
Carius, George E., Design Engr.
Campbell, William E., Acting Mgr.
Carroll, John J., Design Engr.
Christoffel, Jack, Instrumentation Engr.
Clapp, John T., Sr. Engr.
Conn, Kenneth D., Chem. & Mech. Lab. Supervisor
Cox, William T., Head of Department
Dahl, Rudolph, Washington Representative
Dartner, Paul P., Aerobrake Proj. Engr.
Davis, Robert E., Sr. Engr.
Dekker, Albert O., Assoc. Director of Chem
Demetriades, Sterge T.
Dodge, Charles H., Assist. Sr. Engr.
Dolgonas, Gene, Prin. Engr.
Dorman, Bernhardt L., Mgr., Test & Field Service Division
Ehresman, Charles M., Sr. Test Engr.
Elko, Edward R., Head, Thrust Chamber Dept.
Ellis, Herbert B., Technical Specialist
Farber, Milton, Engr., Head of Propellants Section
Fehr, Thomas W., Assist. Sr. Engr.
Fischer, Elliott F., Development Engr.
Folkerts, Keith D., Design Engr.
Geckler, Richard D., Dir. of Quality Control
Geimer, Robert G., Design Engr.
Ginsburgh, Allen S., Sr. Engr.
Glennie, Robert D., Design Engr.
Gold, Marvin H., Associate Director
Gongwer, Calvin A., Manager
Goodreau, Albert J., Assist. Sr. Engr.
Gooze, Arnold, Supervisor, Solid Rocket Testing
Gordon, Robert, Assist. Chief for Aircraft Eng.
Gore, Marvin R., Development Engr.
Gore, William L., Director of Sales
Green, Leon, Jr., Sr. Eng., Solid Eng. Dept.
Greenberg, Arthur B., Development Engr.
Greenfield, Harold H., Devel. Engr.
Guest, Thomas E.
Helier, William, Development Engr.
Henze, Harry, Assist. Sr. Engr.
Hepkema, Robert L., Design Engr.
Hirsch, Robert L., Sr. Engr.
Hitchcock, Ellwood T., Supervisor of Quality Engng.
Holcomb, Don C., Sr. Engr.
Holderness, Eugene R., Devel. Chemist
Holzman, David, Devel. Engr. "A"
Hopkins, Berne H., Design Engr.
Hosier, C. W., Jr., Assist. Director of Sales
House, William C., Prin, Engr. Study Dept.
Inouye, Kaoru, Process Control Chemist
Jenkins, Orin D., Instrumentation Tech.
Kadota, Hayao, Des. Engr.
Kimball, Dan A., President
Klager, Karl, Dept. Head
Klenha, Robert J., Test Engr.
Knoll, E. F., Assist. Sr. Engr., Group Leader
Krumbholz, Stanley G., Dev. Engr.
Kurtz, William J., Dept. Head, Rocket & Mechanical Testing Dept.
Lawrence, Ralph W., Assist. Sr. Chemist
Lessley, Robert L., Development Engr.
Litt, William
Lorman, Edmund F., Sr. Engr.
Lucken, Ernest G., Sr. Engr.
Lynch, James R., Contract Coordinator
McKevitt, Frank X., Design Engr. "B"
Machlanski, Sigmund H., Sr. Engr.
Maletz, Michael, Tech. Specialist
Martin, Leo P., Development Engr.
Masterson, Robert B., Jr., Engng. Administrative Coordinator
Meier, Joseph W., Design Engr.
Merboth, Warren J., Regional Rep.
Miesse, C. Charles, Physicist
Mill, Robert J., Chief, Armament Dept.
Minnick, Richard E., Development Engr.
Much, Richard C., Development Engr.
Mulligan, William R., Assist. Sr. Engr.
Mundt, Kenneth F., Dir. of Manufacturing
Murphy, Walter Jr., Director of Industrial Relations
Murray, Wilson A., Design Engr.
Myers, Harry S., Jr., Assist Head, Thrust Chamber Dept.
Niederman, Howard H., Sr. Chemist
Nichols, John F., Head, Arichitect-Engr. Services Dept.
Omori, Thomas T., Sr. Engr.
Owens, Thomas W., Laboratory Tech., Chemical Div.
Parsons, Robert E., Development Engr.
Pierce, James R., Devel. Engr.
Pompa, Michael Francis, Des. Engr.
Prudden, Terry M., Proj. Engr.
Queen, Roy L., Assist. Chief Engr.
Randolph, Carl, Principal Chemist
Reed, Dwight H., Shop Supervisor
Reichard, Emerson S., Jr., Mgr., Contracts Division
Reynolds, James W., Mfgng. Rep.
Roberts, Ernest R., Chief Engr.
Robinson, James M., Devel. Chemist
Rogers, Don E., Devel. Engr.
Rogers, William L., Assist. Gen. Mgr.
Ross, Chandler Cole, Mgr., Liq. Engine Division
Rucks, Edward L., Principal Engr.
Rude, Arthur H., Executive Vice President
Sato, Kazuhiko, Devel. Engr.
Schaff, Alfred, Jr., Head, Field Service
Schneiderman, Herman, Devel. Chem. Engr.
Siff, Walter C., Quality Control Engr.
Sinclair, Lee S., Jr., Principal Engr. Ord Rocket Dept.
Sogorka, John J., Jr., Design Engr., Liquid Eng. Div.
Speyer, Alfred, Devel. Engr.
Spies, Robert, Devel. Engr.
Stark, John K., Devel. Engr.
Taft, William H., Chief, Tech. Publications
Taylor, Clifford L., Test Engr.
Thackrey, James D., Sr. Engr.
Thompson, William R., Devel. Engr.
Urbach, Everett J., Assist. Sr. Engr.
Van De Verg, Nathaniel, Tech. Specialist
Van Ornum, D. M., Northwest Regional Rep.
Virga, Russell A., Quality Control Engr.
Wahlin, Hugh R., Design Engr.
Walker, Thorp B., Sr. Engr.
Waller, Cecil E., Devel. Engr.
Wang, David K., Design Engr.
Warfel, John S., Mgr. of Research
Whipple, G. Graham, Assist. Mgr.
Whitley, Charles M., Washington Rep.
Wilson, E. Milton, Sr. Chemist
Wittgen, Jack, Supt., Plant Control
Wolff, Henry, Devel. Engr.
Yob, Parry C., Chemist
Young, David A., Principle Engr.
Zettle, Dennis E., Devel. Engr.

Covina, Calif.
Johnson, Donald E., Proj. Engr.

Dayton, Ohio
Longyear, Alfred B., Tech. Rep.

Ft. Worth, Texas
Laski, Edwin C., Regional Representative

Huntsville, Ala.
Artley, Gordon E., Southeastern Reg. Rep.

Sacramento, Calif.
Anderson, Bert J., Proj. Engr.
Ball, James R., Design Engr.
Beighley, Clair M., Sr. Engr.
Bell, Joseph H., Design Engr.
Bernstein, Boris A., Devel. Engr.
Bornstein, Lawrence J., Proj. Engr.
Bourne, John C., Jr., Engr.
Burdick, W. E., Works Mgr.
Carness, Marvin Michael, Design Engr.
Cavender, William D., Jr., Design Engr.
Chester, E. Duane, Design Engr.
Coplen, Herman L., Jr., Prin. Engr.
Coss, Frank A., Sr. Proj. Engr.
Davis, Jimmie A., Design Engr.
Dean, Leo E., Devel. Engr.
Drefs, Herbert W., Instrumentation Tech.
Fenton, Wayne H., Devel. Engr.
Greenberg, Stanley, Design Engr.
Griffin, Jerry, Engng. Aide
Haas, John E., Instrumentation Tech.
Haley, Earle D., Jr.
Hull, James R., Design Engr.
James, George S., Tech. Writer
Katz, Richard, Design Engr.
Koester, Harold E., Design Engr.
Krancz, Joseph A., Checker
Kurt, George, Supervisor
Landesberg, Erwin, Engr.
Large, Charles B., Mgr., Quality Control
Lawrence, Hewson, Devel. Engr.
Livingston, Frank W., Design Engr. "B"
McLaskey, Vernon A., Devel. Engr. "A"
McLearie, John R., Sr. Buyer

Mertz, E. R., Sr. Engr.
Miller, Gustavus S., Jr., Devel. Engr.
Nagin, Ira, Devel. Engr.
Neu, Edward A., Jr., Sr. Engr.
Neumann, Richard K., Mathematician
Newman, Robert S., Sr. Engr.
Nord, William J., Devel. Engr.
Nylin, Nels E., Sr. Des.
Peltz, Gunther F., Design Engr.
Peterson, Joseph J., Assist. Mgr., Engng. & Research
Pierce, Jack B., Devel. Engr.
Racicot, Paul Gerald, Devel. Engr.
Rideout, William H., Chief Draftsman
Robertson, Duane E., Instrumentation Leadman
Rocco, Thomas F., Sr. Engr.
Scott, William R., Rocket Test Tech.
Sprenger, David F., Chief Prod. Engr.
Starrett, Daniel, Design Engr. "A"
Stechman, Charles W., Design Engr.
Steinberg, Frederick, Mathematician
Stiff, Ray C., Jr., Mgr. Engng and Res. Division
Stuart, Wendell F., Rocket Test Foreman
Tanenbaum, Dan M., Mgr.
Trew, Robert O., Design Engr.
Webster, Harry L., Lab. Tech.
York, Harry J., Devel. Engr.
Young, Robert B., Resident Mgr.

Washington, D. C.
Cowen, John B., Dir. of Govt. Oper.
Gilchrist, John D., Mgr., Washington Oper.
Osborn, Harold F., Washington Rep.

AEROLAB DEVELOPMENT CO., INC.
PASADENA, CALIF.
Crofut, Edward G., Pres. & Dir. of Engng

AERONAUTICAL DIGEST PUBLISHING CORP.
WASHINGTON, D. C.
Beller, William S., Managing Editor
Bergaust, Erik, Rocket & Missile Editor

AERONCA MFG. CORP.,
MIDDLETOWN, OHIO
Page, George A., Jr., Vice Pres., Research & Engng.

AEROPHYSICS DEVELOPMENT CORP.,
SANTA MONICA, CALIF.
Bollay, William, President, Tech. Director
Dean, A., Res. Engr.
Escher, Peter H., Electrical Engr.
Feldman, K. F., Proj. Engr.
Kendrick, James B., Proj. Engr.
Knuth, Eldon L., Aerodynamics Engr.
Moon, Albert I., Stress Analyst "A"
Moore, Dr. Norton B., Aerophysics Spec.
Pollard, Frank B.
Shonerd, David E., Proj. Engr.

AEROPRODUCTS-ALLISON,
VANDALIA, OHIO
Maddux, Gene E., Aerodynamicist

AEROPUBLISHERS, INC.,
LOS ANGELES, CALIF.
Gentle, Ernest J., President and Editor in Chief

AEROQUIP CORPORATION,
JACKSON, MICH.
Hagerstown, Md.
Arthur, Dogan H., Aircraft Sales Mgr.
Reisner, Joseph H., Staff Engr.

AERO RESEARCH INSTRUMENT CO.,
CHICAGO, ILLINOIS
Scadron, Marvin, Chief Engr.

AERO SUPPLY MFG. CO., INC.,
CLEVELAND, OHIO
Smyer, William H., Jr., Proj. Engr.

AGRICULTURAL SUPPLY INC.,
THORN TOWN, IND.
Doctor, John C., President

AIRBORNE ACCESSORIES CORP.,
HILLSIDE, N. J.
Warren, John E., Chief Systems Engr.

AIRCRAFT ARMAMENTS, INC.,
COCKEYSVILLE, MD.
Barr, Irwin R., Chief Ordnance Engr.
Chapman, Robert B. III, Vice Pres. & Assist. Gen Mgr.
Jacobson, Joel M., Vice Pres. & Gen Mgr.
Kahn, Marvin J., Chief Structures & Aerodynamics Dept.
Macht, Stuart M., Engr.
Monson, Franklin A., Sr. Layout Engr.
Smith, Henry A., Sr. Engr.
Webb, William A., Proj. Engr.

AIRCRAFT EQUIPMENT TESTING CO.,
BALTIMORE, MD.
Kupiec, Harry P., General Mgr.

AIRCRAFT INDUSTRIES ASSOCIATION,
WASHINGTON, D. C.
Phillips, James F., Secretary, Guided Missiles Committee

AIR PRODUCTS, INC.
ALLENTOWN, PA.
Doney, Edward, Sales Mgr.
Langer, Julian, Jr. Engr.
Pavlis, Frank E., Vice President
Pool, Leonard P., Pres.
Schilling Clarence J., Chief Engr.
Thomas, William H., Mgr., Govt. Contracts

AIR REDUCTION CO., INC.,
NEW YORK, N. Y.
Slottman, George V., Vice President

Murray Hill, N. J.
Bastress, E. Karl, Jr., Engr.
Moen, Walter B., Section Head

AIR REDUCTION PACIFIC CO.,
VERNON, CALIF.
MacCorkle, Emmett Wallace Jr., Vice Pres.

AIR TRAILS NETWORK,
DAYTON, OHIO
Buchan, Alexander, Vice Pres.

ALCO PRODUCTS, INC.,
SCHENECTADY, N. Y.
Beardsley, Ferris P., Assist. Mgr. Marketing, Defense & Ind. Prod.
Diakoff, Alexis J., Consulting Engr.
Sawyer, R. Tom, Mgr. of Research
Silvey, Mayo S., Mgr. Marketing, Defense & Industrial Products

ALGIN CORP. OF AMERICA,
ROCKLAND, ME.
Stanley, Norman F., Research Dir.

ALLIED CHEMICAL & DYE CORP.,
NEW YORK, N. Y.
Nitrogen Division
Frear, George L., Assist. Mgr., Product Devel.
Eastman, Robert J., Prod. Devel. Tech. Rep.
Solvay Process Division
Ross, Douglas H., Dir. of Product Devel.

ALLIED RECORD MFG. Co.,
HOLLYWOOD, CALIF.
Jones, Bruce C., Chief Engr.

ALLIED RESEARCH ASSOCIATES, INC.,
BOSTON, MASS.
Kelley, Joseph Jr., Vice President
Levy, Lawrence, President

ALLSTATES ENGINEERING CO.,
TRENTON, N. J.
Woods, Robert O., Mech. Designer
Boston, Mass.
Rodman, Wilmot L., Proj. Engr.

Cincinnati, Ohio
Berliner, Wm., Proj. Engr.

AMERICAN BOSCH ARMA CORPORATION
GARDEN CITY, N. Y.
Fischer, Roger W., Proj. Administrator
Neville, Leslie E., Dir. of Public Relations and Advertising
Perelle, Charles W., President
Arma Division
Foss, Clifton T., Vice President and General Mgr.
Gittens, E. Donald, Vice President & Chief Engr.
Guterman, Frederick H., Assist. Vice Pres.- Programs and Customer Relations
Walz, Louis E., Spec. Staff Rep.

AMERICAN BROADCASTING—UNITED PARAMOUNT, INC.
NEW YORK CITY, N. Y.
Anthony, Julian C., Commentator

AMERICAN ELECTRIC FUSION CORP.,
CHICAGO, ILL.
Henke, Edmund J., President and Res. Dir.

AMERICAN MACHINE & FOUNDRY CO.,
NEW YORK, N. Y.
Evans, Thomas P., Deputy Director—Research & Development
Jaros, Zygmunt, Defense Products Mgr.
Boston, Mass.
Hobbs, Marvin, Director of Marketing
Chicago, Ill
Fitzgerald, J. Edmund, Research Mgr.
Olson, Ramon L., Supervising Res. Engr.
Raynor, Severin, Director, Mechanics Res. Dept.
Colorado Springs, Colo.
Paul, Ben E., Mechanics Research Dept.
Greenwich, Conn.
Guarino, Roger C., Assist to Manager
Hofstein, Lawrence L., Group Leader—Mech. Integration
Sigley, Daniel T., Associate Director for Guided Missiles
Pacoima, Calif.
Ash, Arthur B., Manager, Res. & Devel. Section
Golden, Jack, Director
Holzl, Robert A., Chief Devel. Eng.
Lieberman, Seymour, Associate Res. Engr.
Morgan, G. Richard, Res. Engr.
Pasadena, Calif.
Kelsey, George M., Sr. Proj. Engr.

AMERICAN POWER JET CO.,
RIDGEFIELD, N. J.
Chernowitz, George, Director

AMERICAN REINFORCED PLASTICS CO.,
LOS ANGELES, CALIF.
Sait, H. Bernard, Sales Mgr.

AMERICAN ROCKET COMPANY,
WYANDOTTE, MICH.
Zaehringer, Alfred J., President

AMERICAN ROCKET SOCIETY,
NEW YORK, N. Y.
Harford, James J., Executive Secretary
Slade, A. C., Secretary

AMERICAN SINTEEL CORP.,
YONKERS, N. Y.
Stern, George, Vice Pres.—Tech. Director

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
NEW YORK, N. Y.
Davies, Clarence E., Secretary

AMERICAN-STANDARD,
REDWOOD CITY, CALIF.
Parker, Frank A., Jr., Director

AMERICAN VISCOSE CORPORATION, PHILADELPHIA, PA.
Marvin, Philip R., Consultant

ANDERSON GREENWOOD & CO., HOUSTON, TEXAS
Slaughter, Louis, Jr., Vice Pres., Chief Engr.

APPLIED RADIATION CORP., WALNUT CREEK, CALIF.
Garbellano, David W., Vice President

APPLIED RESEARCH, INC., CHICAGO, ILL.
Kiebert, Martin V., Director of Research, Electronics

ARDE ASSOCIATES, NEWARK, N. J.
Mayer, Ernest, Sr. Physicist
Sage, Charles G., President

R. S. ARIES & ASSOCIATES NEW YORK, N. Y.
Aries, Robert S., Consultant

ARKAY RESEARCH ASSOCIATES, WICHITA, KANS.
Ruby, Samuel, Chemical Consultant and Group Coordinator

ARMOUR FERTILIZER WORKS, BARTOW, FLA.
Constant, Clinton, Tech. Asst.

ARMOUR RESEARCH FOUNDATION, CHICAGO, ILL.
Brabets, Robert I., Assoc. Chem. Engr.
Cushing, Vincent J., Mgr., Prop. Res.
Erikson, Ted Allen, Asst. Chem. Engr.
Frankson, Karl D., Asst. Engr.
Hansen, Larry J., Design Engr.
Keane, John D., Acting Supervisor, Chemical Engng. Res.
Kinney, Layton C., Assistant Mgr., Chemistry and Chemical Engng. Dept.
Kirkland, John T., Supervisor, Missiles Sec.
Krc, John, Jr., Asst. Supervisor, Analytical Dept. of Chem. and Chem. Engng.
Ljubenko, Dusan J., Asst. Purchasing Agent
Meitner, John G., Head of Research, Chemistry Division
Nothmann, Gerhard A., Mgr., Dept. of Mechanism & Dynamics Research
Nusbaum, Milton S., Associate Engr., Propulsion Div.
Platz, Gerald M., Asst. Supervisor, Propellants Chemistry Research
Schmidt, Leo T., Supervisor
Thorp, Clark E., Mgr., Dept. of Chemistry and Chemical Engng.
Tzantzos, George J., Associate Engr., Propulsion and Structures

ARO, INC., TULLAHOMA, TENN.
Bloxsom, Daniel E., Engr.
Jones, Ira P., Jr., Staff Engr.

ASSEMBLED PRODUCTS CO., LYNBROOK, N. Y.
Lembeck, William, Partner-Design Engr.

ASSOCIATED ENGINEERS, INC. AGAWAM, MASS.
Hellquist, George A., Employment Superv.
Pastore, Michael W., Sr. Proj. Engr.
Viets, William D., Proj. Engr.

ASSOCIATED MISSILE PRODUCTS CORP. POMONA, CALIF.
Stanly, Albert L., Administrative Mgr., Engng. Division

ASSOCIATION OF AMERICAN RAILROADS, CHICAGO, ILL.
Coburn, Seymour K., Chem. Engr., Engng. Division

ATLANTIC DESIGN CO., NEWARK, N. J.
Harkiewicz, Chester, Checker-Print

ATLANTIC REFINING CO., PHILADELPHIA, PA.
Rimmer, Peter G., Physical Tester, Res. & Devel. Dept.

ATLANTIC RESEARCH CORP., ALEXANDRIA, VA.
Archer, Harry J., Engr. Cnsultant
Friedman, Raymond
Grover, John H., Chem. Engr.
Myatt, DeWitt O., Mgr. of Development
Rice, Millard Lee, Director, Applied Mathematics & Interior Ballistics Div.
Roberts, W. Cameron, Jr., Proj. Engr., Chemist, Chemistry Dept.
Rossen, Joel N., Chemical Engr.
Scurlock, Arch C., Pres. and Treasurer
Vande Vrede, Robert G., Project Engr., Chemistry Division
Weil, Lester L., Director, Chemistry Div.

Pasadena, Calif.
Philipson, Joseph, Western Representative

AUSTIN CO., NEW YORK, N. Y.
Venerdi, Vincent P., Mech. Designer, Special Devices

AVCO MANUFACTURING CORP., STRATFORD, CONN.
Adams, Mac C., Deputy Dir., Research & Advanced Development Div.
Hoercher, Henry Erhardt, Assoc. Scientist, Advanced Development Division
Kahane, Abraham, Aerodynamics Sect.
Chief, Research & Advanced Dev. Div.
Kantrowitz, Arthur, Director, Research & Advanced Development Div.
Kyger, Jack A., Project Dir., Research and Advanced Development Div.
Lichtenstein, Immanuel, Tech. Asst. to V. P. of Research
Wilson, Robert W., Project Engr., Advanced Development Div.

Cincinnati, Ohio
Berry, Harvey H., Sr. Engr., Advanced Development Group, Crosley Div.
Lynn, George A., Systems Engr., Electronic Production Product Engng.

Everett, Mass.
Feldman, Saul, Advanced Develop. Engr., Research Labs.

Nashville, Tenn.
Shewchuck, D. D., Liaison Engr. "A"

AVIATION WEEK NEW YORK, N. Y.
Anderton, David A., Asst. Managing Editor (Technical)
Lefer, Henry, Associate Editor

AVICA CORP. NEWPORT, R. I.
Chorley, Percy E., Gen. Sales Mgr.
Millar, John H., Gen. Mgr.
Weiss, Richard S., Chief Sales Engr.

AXELSON MANUFACTURING CO. LOS ANGELES, CALIF.
Shields, G. R., Aviation Sales Mgr.

BAIRD ASSOCIATES, INC., CAMBRIDGE, MASS.
Billings, Bruce H., Vice Pres. & Gen. Mgr.

THE BALTAZOR CO., NEW ORLEANS, LA.
Baltazor, Albert A., Owner

W. F. AND JOHN BARNES COMPANY, ROCKFORD, ILL.
Johnson, Frederick M., Exec. Asst. to Pres.

BATTELLE INSTITUTE, COLUMBUS, OHIO
Basham, Sam J., Jr., Mechanical Engr., Research
Bowman, Richard E., Principal Chemist
Lemmon, Alexis W., Jr., Assistant Chief, Chemical Engng. Res.
Putnam, Abbott A., Asst. Division Chief, Aeronautics & Thermodynamic Div.
Salmassy, Omar K., Principal Mech. Engr., Metallurgical Engng.
Weller, Albert E., Jr., Principal Engr.

BECHTEL CORPORATION, SAN FRANCISCO, CALIF.
Heselton, Robert G., Electrical Draftsman, Refinery Div.

BECKMAN & WHITLEY, INC., SAN CARLOS, CALIF.
Place, E. William, Mgr., Guided Missile Prod. Div.

BEDINGER PRODUCTS CORP., ALAMOGORDO, N. M.
Bedinger, Joseph A., President

BEECH AIRCRAFT CORP., WICHITA, KANS.
Allen, Paul E., Mgr., Quality Control & Customer Service
Anselm, R. Harvey, Staff Engr., Weapons Requirements, Missile Engng. Div.
Burleigh, Dean E., Mgr., Engng. Administration
Calhoun, John T., Design Engr.
Collins, D. T., Weight Analysist
Gordon, M. J., Chief of Preliminary
Hodges, Roy A., Engr.
Jeffries, Robert Richard, Aerodynamics Engr.
Miller, Richard J., Stress Engr., Structures Dept.
Monts, L. Frank, Staff Engr.-Propulsion, Engng. Dept.
Nelson, Louis D., Des. Engr., Power Plt. Prelim. Des.
Odevseff, Alec S., Mgr., Military Engng.
Pro, Wilbur F., Rocket Propulsion Systems Engr., Missile Engng.
Reagan, James F., Mgr., Missile Engng.
Schmidt, Gerald F., Tech. Illustrator A.
Stevens, Calvin L., Aerodynamicist
Taylor, T. R., Contract Requirements Engr.

BEHR-THOMSON, INC., STUTTGART, GERMANY
Riedel, Walter, Mgr.

BELL AIRCRAFT CORP., BUFFALO, N. Y.
Bailer, Edward R., Expediter-Investigator
Bell, Lawrence D., President
Berke, Harold, Rocket Data Analysis Engr.
Best, Bushnell, Test Engr., Rocket Lab.
Blanton, John W., Turbine Pump Group Leader
Bottaro, Andrew, Rocket Labortary Sub-Section Leader
Breidenstein, Richard M., Aerodynamicist
Byington, Harry W., Rocket Res. Engr., Rocket Dept.
Carpenter, Paul, Rocket Design & Service Instructor, Rocket Dept.
Clack, Seth, Adm. Sub-Section Leader
Colt, John Z., Rocket Lab. Group Leader
Cowgill, Edward L., Flight Test Engr.
Culp, Donald H., Asst. Foreman, Functional Test Lab.
Culverwell, Clifford H., Rocket Lab. Tech.
Deptua, Joseph J., Installations Engr., Rocket Dept.
Donnenworth, Creighton T., Rocket Test Group Leader, Test Dept., Engng. Div.
Duane, Raymond R., Asst. Proj. Engr.
English, William J., Missile Technician
Eusanio, Emil N., Design Engr., Rocket Dept.

Feld, David, Acting Group Leader, Rocket Install., Rocket Section
Foster, Richard Bruce, Preliminary Des. Group Leader
Ferullo, Harry A., Proj. Engr., Rocket Engng. Dept.
Fredericks, Jim, Test Engr.-Gas Turbine Pump, Rocket Test Dept.
French, G. Thomas, Rocket Facilities Group Leader, Rocket Dept.
Frisch, John A., Technical Aide, Laboratories Planning
Graf, Henry R., Des. Engr., Rocket Dept.
Gray, Robert H., Sr. Rocket Instrumentation Engr., Rocket Dept.
Guendel, Herbert H., Technical Assistant
Hadley, William L., Dynamics Engr., Engng. Division
Haney, Byron E., Development Engr., Rocket Section
Heiss, Franklyn B., Drafting Consultant, Rocket Section
Heubusch, Henry Ph., Asst. Propellants & Materials Group Leader, Rocket Dept.
Jansen, Howard J., Rocket Installation Group Leader
Kalp, Lester H., Lab. Tech.
Kasper, Walter, Dynamics Engr.
Kenneally, Edmund D., Test Engr.
Knoble, Robert L., Lead Technician, Hydraulic Servomechanisms Dept.
Krull, Stephen D., Rocket Lab. Sub Section Leader
Kubica, Andrew John, Mech. Engr.
Lennon, William E., Sr. Co-Ordinator and Expeditor
Lewinski, Stanley F., Rocket Installations Engr., Rocket Dept.
Lewis Raymond J., General Technician Supervisor
Long, Sam A., Chief Chemist
Lucas, Henry A., Sr. Test Engr., Rocket Division
Magalhaes, John A., Rocket Sect. Engr.
Moore, Wendell F., Rocket Installations Engr.
Mueller, Heinz, Group Leader, Rocket Engine Design, Rocket Dept.
Narog, John Jr., Test Coordinator
Norman, Ronald F., Trainee
O'Malley, James A., Jr., Project Aerodynamicist, Engng.
Petrozzi, Paul J., Rocket Res. Engr.
Potter, Robert L., Combustion Research Group Leader
Powell, William C., Engng. Test Pilot, Flight Test
Prybylski, John R., Des. Engr., Rocket Div.
Racisz, Stanley F., Aerodynamicist
Raisen, Eliott, Rocket Engr., Propellant Laboratory
Reed, George A., Field Test Director
Reichel, Rudolf H., Rocket Develop. Engr.
Reinhardt, Thomas F., Rocket Res. Section Leader, Rocket Engine Dept.
Rinehart, Dewey, Asst. Chief, Rocket Sec.
Roach, Robert D., Jr., Rocket Design Engr., Rocket Division
Rossmann, Theodor G., Rocket Consultant, Rocket Div.
Saltarelli, Eugene A., Design Engr., Rockets Division
Sandstrom, R. J., Vice President, Engng.
Schiavone, D. C., Engr.
Sing, Daniel Y., Project Structures Engr.
Sing, Paul Y., Rocket Design Engr., Rocket Section
Smith, William M., Chief Rocket Engr., Rocket Eng. Dept.
Spoon, George E., Tech. Aide to Chief to Chief of Gen. Engng. Labs.
Springstead, Elliot T., Components Test Engr., Rocket Div.
Stanton, Earl G., Mgr., Photographic-Motion Picture Dept., Niagara Frontier Division
Stengel, Melvin G., Project Co-ordinator, Rocket Engng. Dept.

Stephenson, Frank W., Jr., Rocket Eng. Engr., Rocket Eng. Design Group
Sterman, Albert P., Assist. Structure's Unit Leader, Rocket Dept.
Van Lonkhuyzen, John H., Chief, Technical Department-Engng.
Willet, Robert M., Jr., Engng. Planning Coordinator, Engng. Div.
Williams, Clayton W., Engr.
Wynd, Leo F., Sr. Rocket Components Test Engr.
Zannes, Tommie, Sr. Test Engr.

Edwards AFB, Calif.

Amell, Richard Wm., Rocket Test Tech., Rocket Dept.

Holloman AFB, N. M.

Browning, Dale P., Quality Control Representative, Inspection Div.
Fritz, William C., Electronics Tech., Holloman Air Development Center
Jacobs, Irving V., Rocket Powerplant Tech.
Thurber, Kenneth W., Lead Technician, Power Plant
Weber, Lawrence A., Crew Chief, Field Test Division

BELL AND HOWELL CO., CHICAGO, ILL.

Stanonis, Alphonso F., Res. Engr., Research Dept.

BELL TELEPHONE LABORATORIES, INC., NEW YORK, N. Y.

Murray Hill, N. J.

Bode, Hendrik W., Direct. Res.-Physical Sciences, Research Dept.

Whippany, N. J.

Higgins, William H. C., Direc. of Military Electronics Development
Hough, Richard R., Dir. of Military Systems Dev.
Richey, James D., Technical Staff, Underwater Systems Development Dept.
Tinus, William C., Vice President
West, Julian M., Director of Military Systems Engng., Military Electronics Dept.

BENDER WHOLESALE CO., RAPID CITY, S. DAK.

Bender, Eugene H., General Mgr.

BENDIX AVIATION CORP., DETROIT, MICH.

Fontaine, A. P., Vice President-Engng.
Geller, R. E., Dir. Spec. Prod. Res.
Haddad, Michael T., Electronic Test Engr.
Selvidge, Harner, Director Special Products Development

Bendix Pacific Division

Cooper, Edwin O., Service Mgr., West Coast Division
Dickey, Forrest B., Design Engr., Missile Development
Horning, Thomas D., Engr., Telemetry Section

Bendix Products Division

DeFrees, Robert E., Proj. Engr., Research & Development
Duchek, Burton J., Asst. Eng., Engng. Evaluation
Ellsworth, Chas. R., Ram-Jet Engr., Ram-Jet, Turbine & Hydraulics Gr.
Goslee, John W., Sr. Service Engr., Fuel Metering Technical Service Dept.
Halpin, Eugene P., Technical Asst. to Gen. Mgr., Missile Section
Heller, Douglas M., Director of Engng., Missile Plant
Kuto, George R., Asst. Engr., Missile Div.
Lessing, Calvin G., Asst. Mathematician, Missile Section
Loy, Carl A., Associate Engr., Airframe Design, Project Engng. Group, Missile Section
Mock, F. C., Director, Fuchs Systems Engr., Missiles Div.
Russell, C. R., Test Engineer, Products Division, Missile Section
Shaar, Camille M., Jr., Chief Project Engr., Products Div., Missiles
Webb, Wilbur L., Gen. Mgr., Products Div.

Eclipse-Pioneer Division

Bevins, James E., Chief Mechanical Engr.
Lansing, Raymond P., Vice President, Group Executive and Director
Messerly, George H., Sr. Engr.
Saxton, Robert G., Assist. Sr. Engr., Systems Engng. Section
Sylvander, Roy C., Director of Engng.
Tobias, Leonard W., Design Engr
Villiers, Charles Amherst, Engng. Liaison Europe

Hamilton Division

Bailey, Frank A., Lab. Tech.
Brown, Earl T., Engng. Lab. Tech.
Marshall, John T., Chief Engr.
Mizen, Walter J., Project Engr.
Puckett, Eugene A.

Pioneer Central Division

Tingle, William W., Proj. Engr., Fuel Flowmeter Division

BERGEN ENGINEERING & DEVELOPMENT CORP. TETERBORO, N. J.

Palen, Peter H., Mgr. Valve Division

BLAW-KNOX CO., ERIE, PA.

Knarr, Henry S., Res. Engr., Research Dept.

E. W. BLISS COMPANY,
CANTON, OHIO

Chamberlain, Chester A., Secretary and Asst. to the President

BOEING AIRPLANE CO.,
SEATTLE, WASH.

Acurio, John, Assoc. Res. Engr. "A"
Alexander, John D., Staff Engr.-Tech. Res. & Devel. Staff, Pilotless Aircraft
Annis, Prince R., Tool and Prod. Planner
Atkinson, Mary L., Jr. Engr.
Bonifaci, Leonardo P., Res. Engr.
Bridgforth, Robert M., Sr. Group Engr., Power Plant Staff
Brousseau, Joseph A., Jr., Res. Engr., Power Plant Unit, Pilotless Aircraft Div.
Budish, Nathan N., Preliminary Design Engr.
Bush, Dallace K., Research and Development Engr.
Carkeek, Richard W., Res. Engr., Power Plant Dept.
Christensen, Ray G., Staff Engr.
Coon, W. Emmett, Res. Engr., Bomarc Test Section, Pilotless Aicraft Div.
Cope, Nevin H., Design Engr., Power Plant, Pilotless Aircraft Div.
Davis, Hugh J., Design Specialist
Drury, Jim C., Res. Engr., Guided Missile Div.-Power Plant Staff Unit
Finley, William L., Associate Res. Engr. A, Mechanical Equipment Unit
Gray, William L., Sr. Group Engr., Operational Analysis, Pilotless Aircraft
Hacherl, Regis A., Associate Res. Engr., Power Plant Research
Hansen, Walter J., Engr. Designer "A", Pilotless Aircraft Div.
Hettrick, George W., Research Engr.
Jewett, Robert H., Chief Engr., Pilotless Aircraft Div.
Jordan, John A., Assoc. Res. Engr., Physical Research Staff
King, Archer E. III, Engr., Flt. Anal. Group, Pilotless Aircraft Div.
Kirkwood, Keith S., Field Service Representative, Pilotless Aircraft Div.
Lakey, George L., Engr.-Supervisor, Pilotless Aircraft Div.
Leszynski, Stanley W., Research Engr. A, Pilotless Aircraft Div.
Metcalf George E., Assoc. Res. Engr. A, Physical Res. Staff
Mills, Walter B., Res. Engr.
Murphy, Edward D., Flight Test Engr., Power Plant
Nordstrom, Carl J., III, Assoc. Res. Engr. A,
Norelius, Marvin L., Assoc. Res. Engr.
Owen, Darrel M., Jr. Engr.
Plath, Robert, Project Engr.
Ramroth, William G., Engr.
Reed, George W., Design Engr.
Rhodes, Glen L., Mech. Engr.
Ribanyi, Paul, Res. Engr.
Ringe, G. Truxton, Group Engr.-Prelim. Design
Ruder, Nathan S., Rocket Propulsion Group Engr.
Sanders, William C., Res. Engr.
Setterlund, Gordon, Associate Res. Engr.
Smith, Almontie C., Process Co-ordinator-Special
Sparrow, Chester D., Flight Test Engr.
Sprattling, Willis, Jr., Design Specialist
Stewart, Douglas H., Res. Engr. "A"
Stoner, George H., Staff Assistant
Sutherland, George S., Res. Engr.
Truly, Richard H., Engr.
Wood, Lysle A., Vice Pres. and Gen. Mgr., Pilotless Aircraft Div.

Patrick AFB, Fla.

Campbell, Paul B., Facility Co-ordinator
D'Alli, Sebastian J., Missile Test Engr.
Gardner, Arthur J., Design Engr.
Hill, Fosdick E., Res. Engr.
Holmes, Alfred F., Sr. Lab. Supervisor, Flobac Div.
McDaniel, Keith K., Field Test Director
Risley, William L., Jr., Field Test Engr.
Toney, Harold E., Missile Mech.
White, Orral C., Coordinator

Wichita, Kans.

Barnes, Clarence E., Jr., Sr. Supervisor, Production Illustration Group
Crispano, Alan J., Engr.
Fox, Frederick K., Stress Analyst "A"
Holloway, Richard B., Associate Engr.
Howard, Duane W., Res. Engr.
Jacobs, Frank, Jr., Res. Engr., Metallurgy
Long, C. Marvin, Res. Engr.
Marino, Eugene H., Res. Engr.
McMurtrey, Lawrence J., Res. Specialist
Roberts, Edward H., Assoc. Engr.-Stress
Vanik, Milford F., Chief of Tech. Staff
Young, William J., Tool Engr. "B"

BOND RESEARCH LABS., INC.,
SOMERVILLE, MASS.

Guaraldi, Leonard A., V. Pres., Chief Engr.

BORG-WARNER CORPORATION
BEDFORD, OHIO

Schalla, Clarence A., Chief Proj. Engr.

BOROLITE CORP.
PERTH AMBOY, N. J.

Stach, Otto R., General Mgr.

BRADCO, INC.,
BALTIMORE, MD.

Joyce, Temple N., President

BRANIFF ENGINEERING CO.,
OKLAHOMA CITY, OKLA.

Milam, William T., President

BROOKS & PERKINS, INC.,
DETROIT, MICH.

Kirkpatrick, James S., Vice Pres., Research and Development

BROWN'S CAMERA,
JACKSONVILLE, FLA.

McLeod, John F., Owner

BRUSH ELECTRONICS CO.,
CLEVELAND, OHIO

Harris, J. H., Vice President, Planning
Hempel, Roy A., Proj. Engr., Product Design
Lynch, T. E., Vice President
Parkinson, David B., Gen. Engr. Mgr.
Pierce, Donald E., Assist. Mgr., Equipment Dept.

BULOVA RESEARCH AND DEVELOPMENT LABS., INC.,
FLUSHING, N. Y.

Shelley, Edwin F., Chief Engr.

Woodside, N. Y.

Fenton, Stuart J., Prin. Aerodynamicist
Petrides, Thracy, Head, Advanced Systems Dept.
Steele, Theodore K., Staff Engr., Research

WILLIAM A. M. BURDEN & CO.,
NEW YORK, N. Y.

Burden, William A. M., Partner

CALIFORNIA RESEARCH CORPORATION
RICHMOND, CALIF.

Brandt, Harry, Res. Engr.
Pino, M. A., Res. Engr., Chemicals Div.

CAMBRIDGE CORP.,
LOWELL, MASS.

Warner, Roger S., Jr., Vice President

CANADAIR, LTD.,
MONTREAL, CANADA

Schaefer, Everett B., Asst. Chief Engr.

CANADIAN LIQUID AIR CO., LTD.,
MONTREAL, CANADA

Savard, Guy, Mgr., Develop. & Engng. Dept.

CARBIDE & CARBON CHEMICALS CO.,
NEW YORK, N. Y.

Bateman, Robert L., Director, Prod. Devel.
Benedict, Donald B., Vice Pres., Research, Development & Fibers
Fogel, Elston E., Vice President
Joslin, Richard M., Sales Mgr., Industrial Chemicals Div.
Law, George H., Director of Research
Ross, Alfred C., Los Angeles Sales Mgr.

CARBORUNDUM COMPANY,
(Refractories Division)
PERTH AMBOY, N. J.

Barr, Robert A., Sales Mgr., Refractories Division
Johnson, Boyd M., Vice Pres., Refractories Division
Nicholson, Kenneth C., Supervising Engr., Research & Dev. Div.
Stach, Otto R., Mgr., Ceramic Fiber Proj.
Ten Eyck, John C., Washington Rep.
Turner, Arthur A., Mgr. Engng. Br.
Wroten, William L., Jr., Sr. Engr., Tech. Services

CARRIER CORP.,
SYRACUSE, N. Y.

Jensen, Richard C., Design Engr.

CARSON & SON,
HUGHSON, CALIF.

Carson, William T., Jr.

CARTER LABORATORIES, INC.,
PASADENA, CALIF.

Carter, James M., President

CELANESE CORPORATION OF AMERICA,
SUMMIT, N. J.

Harris, William P., Laboratory Technician

CEMENTOS ANAHVAC, S.A.,
MEXICO

Derrom, Donald L., Assist. Director General

CENTRO TECNICO DE AERONAUTICA,
SAO PAULO, BRAZIL

Rebello, Fernando P., Engr.

CEN-VI-RO PIPE CORPORATION,
SOUTH GATE, CALIF.

Peirsol, James H., Chief Engr.

CESSNA AIRCRAFT COMPANY,
WICHITA, KANSAS

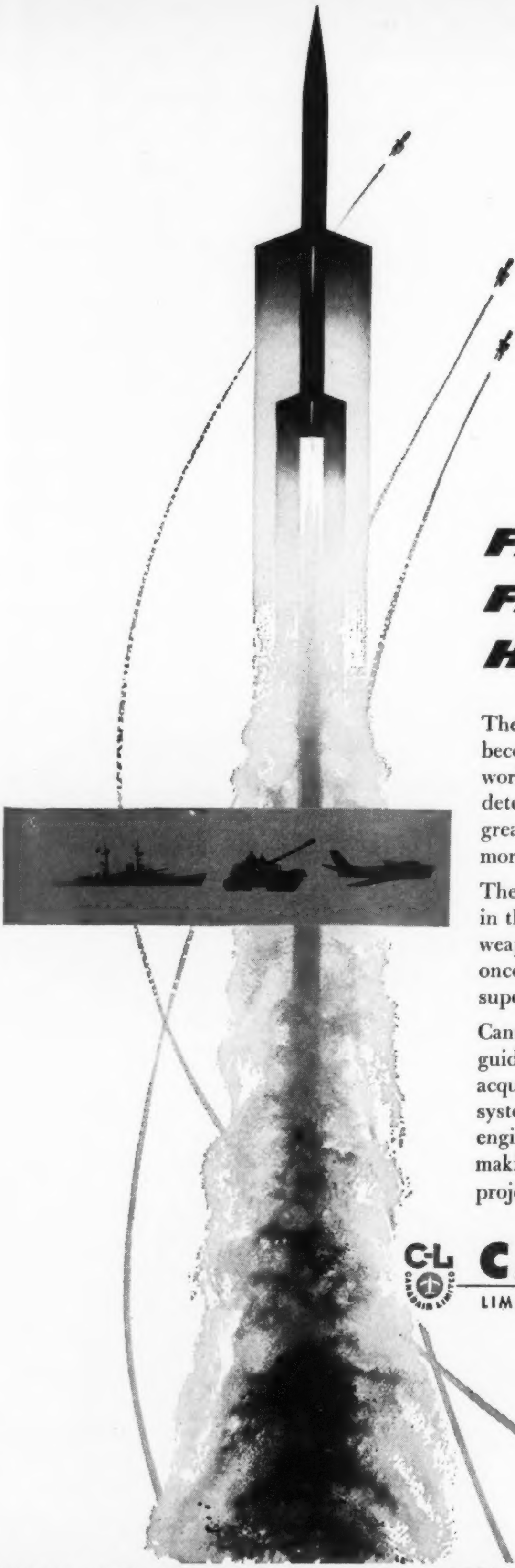
Ahrens, Donald J., Project Engr.
Bauer, Norman D., Propulsion Systems Supervisor
Petroff, Alex N., Dir. of Res.
Roth, Don C., Engr.
Salter, Tom, Vice President, Engng.
Waring, Henry F., Chief Engr., Military Aircraft

CGS LABORATORIES, INC.,
STAMFORD, CONN.

Sontheimer, Carl G., Exec. Vice President, Director of Engng.

CHANCE VOUGHT AIRCRAFT, INC.,
DALLAS, TEX.

Blaylock, Raymond C., Vice Pres., Engng.
Brimmer, Robert A., Proj. Engr.
Buckstaff, John D., Jr., Propulsion Engr.
Caltabiano, Salvatore, Sr. Propulsion Engr.
Clark, John Russell, Asst. Chief Eng.-Aircraft Projects
Gibbons, Henry B., Asst. Chief Engr., Technical
Graham, Harry M., Prop. Proj. Engr.
Jordan, Harold R., Colonel USMC, Retd.
Ludwig, John W., Supervisor, Design Group
Murty, Kenneth T., Prop. Engr.
Perry, Samuel O., Assist. Chief Engr., Missile Projects
Posch, Ralph F., Sr. Propulsion Engr.
Rodean, Howard C., Lead Propulsion Analyst



FASTER
FARTHER
HIGHER

The development of guided missiles of every type is becoming one of the most competitive areas in our world today . . . for supremacy in this field can well determine peace for many years. The race is now for greater speed, higher altitude, longer range, more sensitive control.

The strength of Western defense lies to a great extent in the development for the Armed Forces of these new weapons systems suited to the supersonic age. The once deadly cannon, machine gun and rocket are being superseded by complex weapons of great ingenuity.

Canadair has long had a prominent role in Canada's guided missile program, applying the knowledge acquired in years of experience in advanced aircraft systems engineering . . . and Canadair's research, engineering and manufacturing resources are constantly making further important contributions to projects in this field.

CANADAIR
LIMITED, MONTREAL, CANADA
AIRCRAFT MANUFACTURERS

A subsidiary of GENERAL DYNAMICS CORPORATION,
New York, N.Y.—Washington, D.C.

CANADAIR HAS PRODUCED MORE JET AIRCRAFT THAN ANY OTHER CANADIAN MANUFACTURER

Townsend, Samuel J., Chief of Propulsion
Vale, Herbert J., Propulsion Analyst

CHEMICAL CORN EXCHANGE BANK, NEW YORK, N. Y.
Halecky, John P.
Vignot-Van Beuren, Alfred J., Assist. Sec.

CHESAPEAKE INST. CORP., SHADYSIDE, MD.
Fox, Lorick F., Chief Draftsman

C & O RAILROAD CO., SAGINAW, MICHIGAN
Williston, Carl O., Diesel Electrician

CHICAGO BRIDGE & IRON CO., CHICAGO, ILL.
Harris, Chester A., Jr., Assist. Shop Super.
Herman, George R., Eectrical Engr.

CHICAGO MIDWAY LABORATORIES, CHICAGO, ILL.
Adamowicz, Charles M., Sr. Res. Engr.
Affrunti, Andrew A., Assoc. Res. Engr.
Barten, Henry J., Chief, Mechanics Section
Edelman, Bennett H., Chief Resident Engr.
Jacobs, Kenneth Henry, Assoc. Chief Engr.
Malis, Michael F., Research Engr.
Nicolosi, Sebastian J., Assoc. Director

CHICAGO TRIB-N. Y. NEWS SYNDICATE, NEW YORK, N. Y.
Mosley, Zack T., Aviation Cartoonist

THE CHRISTIAN CO., PASADENA, CALIF.
Welsh, John C., Gen. Mgr.

CHRYSLER CORP., DETROIT, MICH.
Africano, Alfred, Head, Power Plant Design Dept., Missile Operations
Bader, Henry, Jr., Liaison Engr.
Ball, Laurence M., Chief Laboratories Engr.
Ball, Peter C., Mechanical Engr.
Brady, C. Allan, Operating Mgr.
Buell, David N., Asst. Dept. Head, Structural Design
Butterfield, John P., Chief Engr.
Dietz, Joseph L., Test and Devel. Engr.
Dofter, Edward J., Head, Materials Lab.
DuDeck, Alvin Paul, Body Engr.
England, Arthur O., Supervisor, Personnel Development
Erickson, Robert P., Proj. Engr.
Felts, Robert, Project Engr.
Forman, Louis B., Head, Elect. Design Dept.
Francis, Ivan M., Project Engr.
Gibson, Charles A., Engr.
Graham, Richard M., Mgr., Quality Control Dept.
Grenus, Michael, Prelim. Des. Engr.
Grochowski, Mitchell, Inspection Superv.
Lawrence, Lovell, Jr., Head Power Plant Design
Loomis, Ralph W., Supervising Engr.
Luecht, John W., Gen. Supervisor, Advanced Design
McBride, Frank E., Supervisor of Project Engng., Assembly Div.
Meldrum, Bernard J., Staff Engr.
Miller, William A., Engine Layout
Murray, Yvonne E., Product Design
Nielsen, Edwin A., Staff Engr.
Oliveto, Frank J., Process Engr.
Rasquin, John R., Supervisor, Electrical Fabrication
Salvador, Galdino, Field Test Rep.
Sampou, Andre P.
Schiavone, Daniel C., Staff Project Engr.
Schram, Jack C., Mechanical Engr.
Swaney, Frank R., Proj. Engr.
Sylvester, Vincent A., Project Engr.
Vehko, Vaino J., Gen. Supv. Product Design
Weatherred, Charles J., Staff Assist.
Williams, Charles W., Mgr., Fabrication & Assembly

Wise, Eugene P., Staff Proj. Engr.
Zerbey III, John F., Plant Engng., Gen. Supervisor

CINCINNATI GAS & ELEC. CO., CINCINNATI, OHIO
Michael, Donald T., Electrical Engr.

CINERAMA INCORPORATED, OYSTER BAY, NEW YORK
Preble, Richard G., Engr.

CITIZENS FIDELITY BANK & TRUST CO., LOUISVILLE, KENTUCKY
Abbott, C. Webster

CLARY MULTIPLIER CORP., SAN GABRIEL, CALIF.
Borden, Jay R., Chief Engr.
Meeks, Paul J., Gen. Mgr., Instrument Div.

CLEVELAND PNEUMATIC TOOL CO., CLEVELAND, OHIO
Gibson, Thomas F., Sr. Tool Designer

CLEVELAND RECORDING COMPANY, CLEVELAND, OHIO
Hamann, Kenneth R., Chief Engr.

CLEVITE-BRUSH DEVELOPMENT CO., CLEVELAND, OHIO
Kliever, Waldo H., Vice President
Lynch, Thomas E., Vice Pres., Director of Ordnance Products

CLIMAX MOLYBDENUM CO., LOS ANGELES, CALIF.
Wilson, John E., Dist. Mgr. & Met. Engr.

CLUNEBONIFF FARMS, NEW CANAAN, CONN.
Senior, John L., Jr., Mgr.

COLEMA ENGINEERING CO., INC., LOS ANGELES, CALIF.
Hood, Wiliam J., Engr.
Krupp, William E., Instrumentation Supv.

COLONIAL AIRLINES, LA GUARDIA FIELD, N. Y.
Wagner, Julius A., Pilot

COMMERCIAL SOLVENTS, INC., NEW YORK, N. Y.
Gwinner, Walter C., Supervisor of Market Research

COMPAGNIE DES ENGINS A REACTION POUR VOL ACCELERE, S.A.E., EGYPT
Bodewadt, Uwe T., Dr. Habil.

COMPAGNIE DES ENGINS A REACTION POUR VOL ACCELERE, ALMAZA EGYPT
Engel, Rolf, Tech. Dir., Engr. in Chief

CONOVER MAST PUBLICATIONS, INC., CLEVELAND, OHIO
Reed, Robert J.

CONSOLIDATED RESEARCH & DEV. CORP., MONROVIA, CALIF.
Pichel, Marlowe A., President & Gen. Mgr.

CONSTRUCCIONES BELGO MEXICANAS, SA., IXTAPALAPA, D. F.
Moreno, Marcelo

CONSULTANTS & DESIGNERS, INC., NEW YORK, N. Y.
McCrocklin, Robert Earl, Devel. Test Spec.
Nelson, Warren A., Design Draftsman

CONTINENTAL AVIATION & ENGNG. CORP., DETROIT, MICH.
Bachle, Carl F., Vice President
Collins, Whitney, Chief Engr.
Genden, Seymour A., Project Engr.
Manera, Salvatore A.

Paget, Harold D., Assist. Proj. Engr.
Silvern, David H., Sr. Proj. Engr., Adv. Engr. Section
Squiers, John C., Staff Engr.

CONTROL ENGINEERING CO., DETROIT, MICH.
Lietz, Arnold R., Chief Engr.

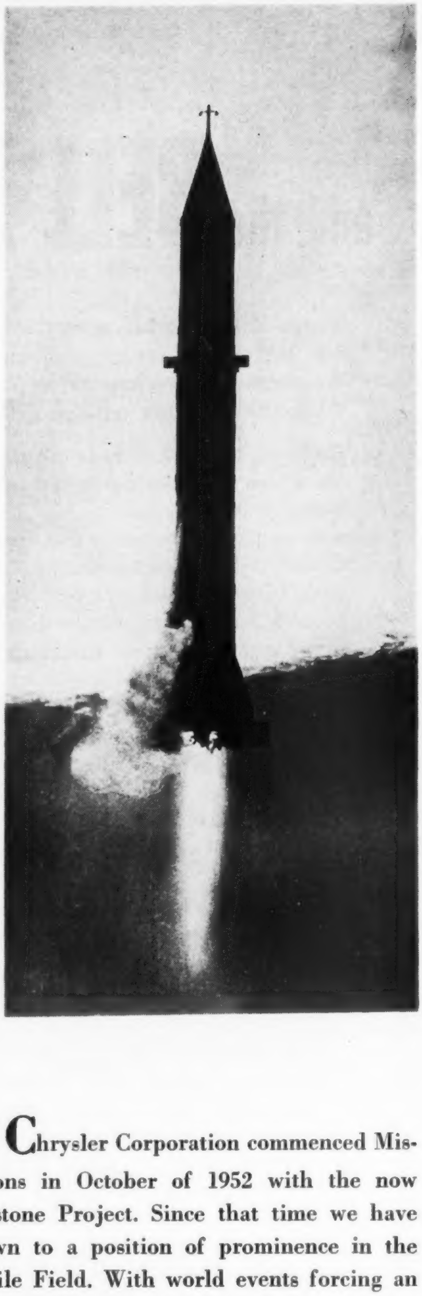
CONTROL INSTRUMENT CO., BROOKLYN, N. Y.
Snow, Frank J., Proj. Engr.

CONVAIR, A DIVISION OF GENERAL DYNAMICS CORPORATION, SAN DIEGO, CALIF.
Berry, Walter, Design Engr.
Bossert, K. J., Assist. Chief Engr.
Clare, Edward T., Chief Electronics Engr.
Clark, Richard A., MSD. Group
Clark, William E., Research Engr.
Coggan, Bernard F., Div. Mgr.
Crooks, James W., Jr., Engng. Des. Spec.
Dempsey, James R., Program Dir., WS-107A Project
Dorrance, William H., Assist to the Director of Scientific Research
Dunatov, Joseph J. Instrumentation Tech.
Ehricke, Krafft A.,Group Engr., Pre. Design & Systems Analysis
Ellis, J. Dean, Design Specialist
Fink, Frank W., Chief Engr.
Frasher, Carl L., Test Engr.
Friedrich, Hans R., Chief Flight Mech. Engr.
Gotkiewicz, Julian A., Test Engr.
Hallman John R., Thermodynamic Engr.
Heald, Daniel A., Sr. Design Engr.
Jirsa, Larmon L., Chief Prop. Group Engr.
Katz, Elliott L., Sr. Thermodynamics Engr.
Lange, Hermann E., Research Dept.
Lester, Wm. A., Sr. Design Engr.
Love, Charles C., Sr. Engr.
Mansfield, Malcolm B., Flight Test Engr.
Muller, Louis F., Sr. Design Engr.
Naish, John V., Executive Vice President
Robison, George F., Research Test Engr.
Rosenbaum, Mortimer, Assist. Chief Engr.
Salisbury, Henry M., Des. Engr.
Schwartz, Edward W., Sr. Thermodynamics Engr.
Sebold, R. C., Vice Pres., Engng.
Sims, Eugene C., Flight Test Engr.
Suvada, William J., Sr. Design Engr.
Swet, Charles J., Sr. Design Engr.
Walker, Charles R., Jr., Proj. Coordinator
Wieland, John A., Sr. Electronics Engr.
Willey, Norman W., Sr. Design Engr.

Daingerfield, Texas
Arnold, J. Elwood, Mgr.

Edwards AFB, Calif.
McLarin, Maitland, Flight Test Instrumentation Engr. (Telemetry)

Ft. Worth, Texas
Anderson, Harold C., Training Assist. Supervisor
Bagnall, Leslie M., Nuclear Engr.
Barone, Martin J., Flight Test Engr.
Berry, Edwin R., Prop. Engr.
Bissell, Howard R., Sr. Field Engr.
Burley, James, Draftsman
Clark, Hoyt, Jr., Training Specialist
Clausen, John T., Aerophysics Engr.
Crabtree, Charles F., Sr. Design Engr.
Craig, George H., Sr. Systems Installation Engr.
Cripliver, C. (Charles) Roger, Engng. Publications Editor
Davis, Frank W., Chief Engr.
Esenwein, August C., Vice Pres.-Mgr.
Haden, Jimmie B., Design Draftsman
Hallam, Robert S., Sr. Test Engr.
Hayes, Robert R., Sr. Nuclear Engr.
Heit, John G., Sr. Field Engr.
House, James P., Electronics Des. Engr.
Karageorge, George J., Test Engr.
Kerr, John A., Sr. Design Group Engr.
Koshiol, George P., Power Plant Engr.



The Chrysler Missile Story

Chrysler Corporation commenced Missile Operations in October of 1952 with the now famous Redstone Project. Since that time we have steadily grown to a position of prominence in the Guided Missile Field. With world events forcing an ever-increasing demand for Guided Missiles, the Defense Department recently disclosed the participation of the Chrysler Corporation in the IRBM and Fleet Ballistic Missile Systems Programs.

Because our activities extend from the drawing boards to the launching sites, we offer unlimited opportunities for engineers with demonstrated leadership ability to become an integral part of the Chrysler Missile team.

With contracts now comitting us to Missile activities for years to come, it is our decision to steadily expand our work force in an all-out effort to encompass every phase of Missile development and production including engineering, research, design, field test consultation, and manufacturing.

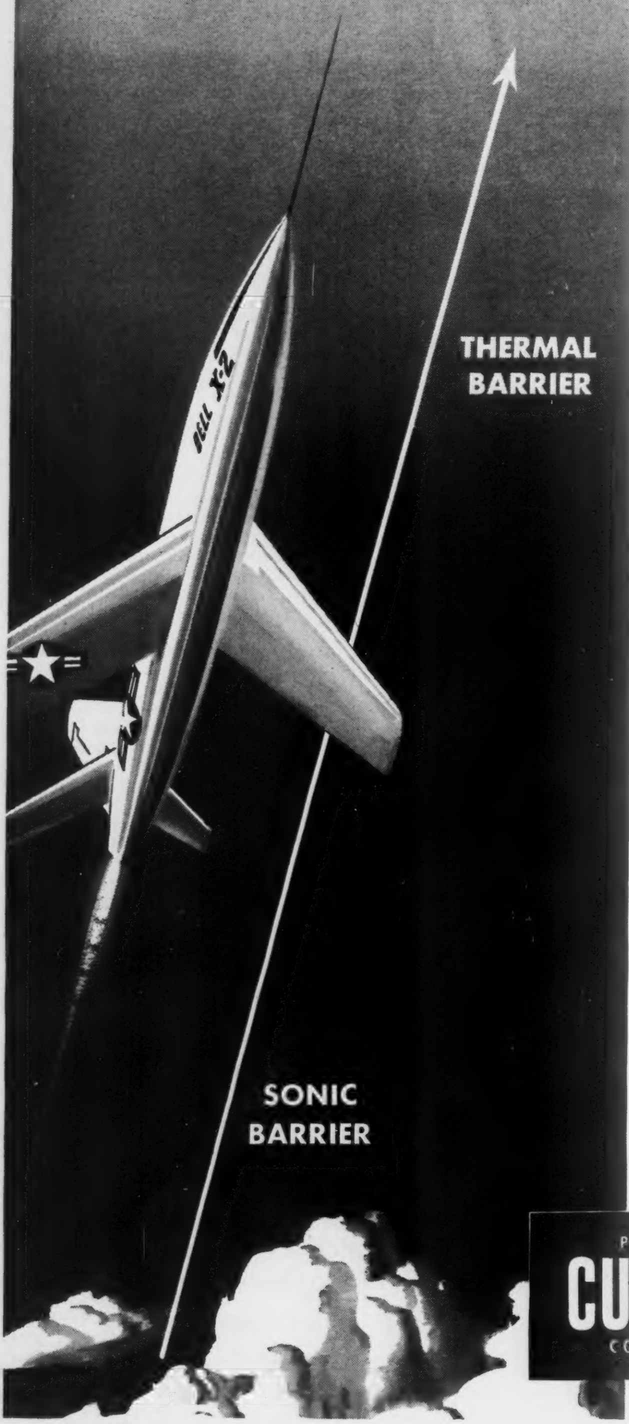
In the Guided Missile Field, Chrysler Corporation is truly the key to an engineer's future.

Address inquiries to:

Chrysler Corporation
Missile Operations

Personnel Department
P.O. Box 2628
Detroit 31, Michigan

CURTISS-WRIGHT ROCKET POWER and the BELL X-2



The throttleable rocket engine that powers the new Bell X-2 is one more example of the design concepts that have earned for Curtiss-Wright its leadership in the aircraft industry.

Exploring the problems of the "heat barrier" . . . where windshields melt and ordinary aircraft metals disintegrate . . . the X-2 employs a thrust equal to the power that drives a Navy cruiser at high speeds. Searing through the sonic barrier (yesterday's problem) and far beyond, it will gather data vital to America's future in the air. Its pilot will be able to throttle the engine up and down, for faster or slower speeds, and start or stop it . . . at will. He will select from a wide range of throttle positions . . . proportioning his fuel and controlling rocket thrust . . . another Curtiss-Wright *first* that makes rocket power practical for tactical aircraft.

Other advanced propulsion systems developed by Curtiss-Wright are powering leading airlines to new records as they go in service on latest re-equipment programs . . . are providing our air forces, and those of our allied nations, with long-awaited *bonus power* for today's spectacular developmental as well as operational aircraft. And there is more . . . much more . . . to come from Curtiss-Wright.

YOUNG MEN! JOIN THE U.S. AIR FORCE

Investigate Career Opportunities At Your Nearest Recruiting Office

PROPELLER DIVISION
CURTISS-WRIGHT
CORPORATION • CALDWELL, N. J.

Lightbrown, L. E., Design Group Engr.
Lukas, Francis S., Buying Supervisor
Nevitt, Charles E., Training Supervisor
Nolan, James R., Sr. Design Engr.
Ransom, Will A., Sr. Aircraft Des. Engr.
Ritter, Arnold P., Sr. Aerodynamics Engr.
Teague, Billie D., Industrial Relations Analyst
Zebrowski, Walter J., Jr., General Rep.

Patrick AFB, Fla.
MacNabb, Byron G., Operations Mgr. — AFMTC

Pomona, Calif.
Chesus, Frank O., Sr. Engr.
Gale, John L., Advanced Terrier Administrative Staff Engr.
Horne, Charles F., Division Mgr.
Marcinek, Jack J., Thermo-Mechanics Group Superv.
Michaels, Walter C., Missile Test Engr.
Parker, Richard S., Electronic Engr.
Robertson, George M., Chief Engr.
Seabrook, Milton R., Missile Test Engr.
Strang, William C., Service Engr.
Wenzel, Robert F., Sr. Thermodynamics Engr.
Woods, Kenneth P., Design Engr.

COOK ELECTRIC COMPANY
CHICAGO, ILL.
Beene, James L.
Carr, Lew J., Sales Engr.
Hasselhorn, Walter C., President
Mayes, Richard A., Ditrict Mgr.
Sabel, Robert W., Mgr.

COOK RESEARCH LABORATORIES,
SKOKIE, ILL.
Henricks, William, Sr. Engr.
Kutrumanes, Constantine P., Jr. Engr.
Turetzky, Arthur A., Sr. Project Engr.

COOLING TOWER INST.,
PALO ALTO, CALIF.
Willa, James Lee, Field Engr.

CORNELL AERONAUTICAL LABORATORY, INC.
BUFFALO, N. Y.
Markstein, George H., Head, Combustion Section
Rudinger, George, Principal Physicist
Waterman, Neil J., Test. Engr.
Zebrowski, Walter S., Operations Engr.

CRAIG SYSTEMS, INC.,
LOS ANGELES, CALIF.
Whittlesey, David W., Sales Engng. Mgr.

CREOLE PETROLEUM CORP.,
LAGUNILLAS, VENEZUELA
Barry, William V., Petroleum Engr.
Croft, Jacob C., Jr., Sr. Mech. Engr.

CROSLEY RESEARCH LABORATORY,
WALTHAM, MASS.
Smilg, David, Designer

CURRAN ENGNG. CO.,
LOS ANGELES, CALIF.
Curran, Louis J., Owner & Chief Mech. Engr.

CURTISS-WRIGHT CORP.,
WOOD RIDGE, N. J.
Ackerman, Anthony T., Field Engr. Jr.
Baum, Charles N., Jr. Test Engr.
Cole, Melvin C., Assist. Proj. Engr.
Diacators, Philip, Intermediate Test Engr.
Gronich, Sigmund, Jr. Test Engr.
Malgeri, Theodore J., Sr. Test Engr.
McKee, O. Grady, Jr., Proj. Engr.
Torstrup, Fred E., Test Engr.

Caldwell, N. J.
Bode, George F., Test. Supvr.
Brady, George W., Dir. of Engng.
Chillson, Charles W., Chief Research Engr.
Corbett, Albert D., Jr., Asist. Proj. Engr.
Dudley, B. W., Assist. Gen. Mgr.
Germano, Joseph J., Engng. Rep.
Herud, Frank R., Engr.
Mallay, John P., Assist. Proj. Engr.
Mergen, Joseph M., Chief Propeller Engr.
Meyer, Marvin, Supervising Proj. Engr.
O'Neill, Louis T., Sales Mgr.-Aeronautical Products
Parilla, Arthur R., Engr.
Sheets, Jack, Works Mgr.
Warden, Harold H., General Sales Mgr.
Wiener, Leonard S., Chief Rocket Design Engr.

Clifton, N. J.
DeZubay, Egon A., Combustion Sec. Head
Schmitt, Heinz E., Div. Chief of the Eng. Division
Wing, George Sherman, Proj. Engr.

THE DAILY TELEGRAPH,
LONDON, ENGLAND
Bertin, Leonard, Reporter

DALMO VICTOR CO.,
SAN CARLOS, CALIF.
Moseley, Tomlinison I., President

DANIEL, MANN, JOHNSON & MENDENHALL,
LOS ANGELES, CALIF.
Doyle, Warren, Design Group Leader
Johnson, S. Kenneth, Partner
Kudroff, Marvin J., Associate & Chief Structural Engr.
Sully, Robert J., Architect

DAYSTROM INSTRUMENT CORP.,
ARCHBALD, PA.
Koorbanoff, Paul A., Proces Eng.

DBM RESEARCH CORPORATION,
COCOA BEACH, FLA.
Mattox, Cliff E., President

DE HAVILLAND ENGINE CO., LTD.,
EDGWARE, MIDDLESEX, ENGLAND
Cleaver, Arthur V., Chief Engineer
Bremner, Robert J., Design Draughtsman

DESIGNERS FOR INDUSTRY, INC.,
PHILADELPHIA, PA.
Skowron, Martin L., Designer

DETROIT CONTROLS CORPORATION,
REDWOOD CITY, CALIF.
Barr, William J., Assist. Research Director
DeMuth, Fred F., Group Leader, Applied Mechanics
Heller, Kenneth G., Proj. Leader

DEUTSCHES RAKETEN-UND RAUMFAHRT-MUSEUM, STUTTGART,
WESTDEUTSCHLAND, GERMANY
Fritz, Alfred

DOUGLAS AIRCARFT CO.,
SANTA MONICA, CALIF.
Aurand, Henry S., Jr., Assist. Proj. Engr.
Bertrando, Bertrand R., Group Leader, Missile Power Plants
Brincka, Donald R., Power Plant Engr.
Burton, Edward F., Chief Engr.
Butler, George V., Staff Assist.
Canright. Richard B., Missile Plant Engr.
Chamberlin, Joseph "Jac" A., Designer
Cole, Don E., Missile Engr.
de Gennaro, T. R., Assoc. Engr.
Dossinger, Donald A., Engr. Draftsman
Dutton, Robert G., Process Engr. B
Gooding, Jack D., Power Plant Engr.
Hill, Bentley G., Chief, Missile Weight Sec.
Holland, Kenneth Deleval, Jr., Mech. Engr.
Huffman, Kenaz, Jr., Contract Admin.
Hughes, James J., Missiles Power Plant Engr.
Hunter, Maxwell W., Missiles Design Engr.
Isbell, Everett C., Jr., Designer
Johnson, Harold W., Gen. Fore. Mfg.
Klemperer. Wolfgang B., Res. Engr.
Lander, William K., Asoc. Engr.
Luskin, Harold, Assist. Chief of Aerodynamics
MacEwan, Robert G., Group Leader, Power Plant Design
Mason, Richard L., Staff Engr.
McCallum, Dougall, Engr.
Miller, Ray A., Field Service Engr.
Parker, Edward H., Assoc. Engr.
Pinkel, George E., Assoc. Engr.
Robinson, John O., Res. Engr.
Rochlen, Ava Michael, Dir. Public Relations
Scheele, Wesley W., Mech. Engr.
Shogron, Ivar L., Power Plant Engr.
Van Voorhees, Walter O., Missile Power Plant Design Engr.
Vincent, Nathaniel R., Equipment Engr.
Walton, A. Lee, Group Leader—Nike B Power Plant
Weise, Carl A., Chief Power Plant Engr.
Wheaton, Elmer P., Chief Proj. Engr.
Young, Edward J., Chief, Missiles Records, Release & Reproduction Section

Edwards, Calif.
Long, Palmer L., Flight Test & Res. Engr.

El Segundo, Calif.
Breidenour, Robert C., Liaison Engr.
Burwell, James J., Ultra Sonic Tech.
Heinemann, Edward H., Chief Engr.
Houghton, Charles P., Aircraft Designer
Morris, Deane N., Design Specialist
Smith, A. M. O., Supv. Design Research

Huntsville, Ala.
Andrews, Arthur R. R., Ord. Engr.

Long Beach, Calif.
Buckwalter, John C., Chief Engr.
Martin, Charles P., Nuclear Group Engr.
Wood, Carlos C., Chief Engr.

Tulsa, Okla.
Dunlap, D. E., Chief Engr.

Waukegan, Ill.
Boroviak, Leonard C., Missiles Service Rep.

DOYLE, KITCHEN & McCORMICK,
NEW YORK, N. L.
Doyle, Harry B., Assist. Account Executive

ALLEN B. DuMONT LABORATORIES, INC.
CLIFTON, N. J.
DuMont, Allen B., Chairman of the Board
Talamini, Arthur, Jr., Engng. Mgr.

Los Angeles, Calif.
Christaldi, P. S.
Kline, Melvin B., Mgr., Missile Engng.
Robertson, Oran F., Section Mgr., Missile Engng. Dept.

Paterson, N. J.
Connor, Robert, Proj. Engr.
Hudson, Kenneth, Section Head.

DUNBAR-KAPPLE INC.,
BATAVIA, ILL.
Glossa, Milton, Assist. to Chief Engr.

B. DUNN & CO.,
NEWINGTON, CONN.
Dunn, Benjamin, President

E. I. DuPONT DE NEMOURS & CO., INC.,
WILMINGTON, DEL.
Downs, Robert R., Engr.
Rogers, John D., Jr., Petroleum Chem. Div.
Van Kirk, Theodore J., Engr.

El Monte, Calif.
Marcum, Elburn, West Coast Tech. Rep.

Niagara Falls, N. Y.
Gniewek, Thomas T., Jr. Engr.

Penns Grove, N. J.
Johnson, William G., Res. Chem. Engr.

THE EADAR CO.,
VAN NUYS, CALIF.
Luther, Kenneth R., President

EAST COAST AERONAUTICS, INC., PELHAM MANOR, N. Y.
Kass, George, Sr. Proj. Engr.
Young, P. Robert, Chief Plastics Engr.

EDITOR & PUBLISHER CO., NEW YORK, N. Y.
McIntyre, Robert B., Adv. News Editor

EDUCATIONAL TESTING SERVICE, PRINCETON, N. J.
Dean, E. Douglas M., Test Specialist, Proj. Director

EGLI AND GOMPF, INC., BALTIMORE, MD.
Barnes, Ellis H., Jr., Mech. Assoc.
Murphy, Thomas V., Mech. Engr.

ELECTRO-CHEMICAL PRODUCTS CO., GARDEN CITY, MICH.
Beauchamp, Jack M., President
Beauchamp, Frank W., Exec. Vice. Pres.
Franklin, Wallace H., Staff Engr.
Quantz, Chester C., Chief Eng.
Spencer, George T., Sales Mgr.
Galitza, John P., President
Maisak, B. Lawrence, Design Engr.
Mills, Hugh A., Mech. Engr.

ELECTROFILM, INC., HOLLYWOOD, CALIF.
Van Phelan, Louis, General Mgr.

EMSCO MFG., CO., LOS ANGELES, CALIF.
Fredhold, Allan B., Jr., Mgr., Commercial Development

ENGINEERING ASSOCIATES, DAYTON, OHIO
Littell, Charles C., Jr., President & Chief Engr.

ENGINEERING SPECIALTIES, PHILADELPHIA, PA.
Rugheimer, Arthur H., Jr., President & Gen. Mgr.

ESSO RESEARCH & ENGINEERING CO., NEW YORK, N. Y.
Sweeney, William J., Vice Pres.

Linden, N. J.
Crampton, Alton B., Sec. Head.
Longwell, John P., Head, Process Research Sect.
Rickles, Nathaniel H., Res. Engr.
Tobias, George S., Sec. Head., Motor Lubricants and Wax

ESTANCIAS LLOBET CULLEN, BUENOS AIRES, ARGENTINA
Llobet, Andres Francisco, Engr.

ETHYL CORPORATION, DETROIT, MICH.
Sugimoto, Roy, Supvr., Process Devel.

ETHYL RES. CORP. LABORATORIES, DETROIT, MICH.
Thomas, Richard W.

EXCELCO DEVELOPMENTS, INC. SILVER CREEK, N. Y.
Arenson, Donald L., Director Research
Brooks, Leroy A., Secretary & Treasurer
Newman, A. J., Vice Pres. & Gen. Mgr.

EXPERIMENT, INC. RICHMOND, VA.
Calcote, Hartwell F., Vice President
Erdman, Frank H., Vice President
McMahill, Victor W., Jr., Contracts Mgr.
Mullen, James W., II, President and Tech. Director
Rathburn, Kenneth C., Res. Associate
Wilkerson, Emery C., Sr. Scientist
Wolf, Robert L., Vice President

EXPORT-IMPORT BANK, WASHINGTON, D. C.

Sawyer, Roland, Special Advisor to the Board of Directors

FADA RADIO & ELECTRIC CO., INC., BELLEVILLE, N. J.

Mock, Wesley C., Jr., Chief Engr. & Works Manager

FAIRCHILD ENGINE & AIRPLANE CORP., HAGERSTOWN, MD.

Bert, Charles W., Aero. Design Engr.
Boutelle, Richard S., President
Flood, Arthur F., Executive Vice President
Lescher, George W., Chairman of Projects Evaluation Board
Silver, Francis 5th, Weight Analyst

Fairchild Engine Div.

Chapline, George F., Vice President & Gen. Mgr.
Ervin, Augustus L., Jr., Sales Engr.
Graupe, Rudolf L., Chief Proj. Engr.
Gregory, Alfred T., Chief Engr.
Gross, Robert A., Res. Engr.

Fairchild Guided Missiles Div.

Harrison, Arthur E., Director of Engng.
Speakman, Edwin A., Vice President and General Manager

Stratos Div.

Boretz, Jonathan E., Sr. Proj. Engr.
Kalikoff, Stanley, Assist Research Engr.

FAIRFIELD SHIPBUILDING & ENG. CO., GLASGOW, SCOTLAND

Beresford, Donald D. B., Mechanical Engr.

FARNSWORTH ELECTRONICS CO., FT. WAYNE, IND.

Brady, Franklyn H., Engineer-in-Charge, Analog Computer Facility, Systems Analysis & Design Section
Day, Donald R., Lead Draftsman
Kruse, Dr. Paul W., Physicist
Stuart, Wiliam D., Antenna Engr.
Vellequette, Murlin J., Assoc. Engr.

F.A.V. DPTO. TECNICO, BOCA DE RIO, VALENCIA, VENEZUELA, S.A.

Marquez, Santos A., Ing. Jefe

FEDERAL TELECOMMUNICATION LABORATORIES NUTLEY, N. J.

Bailey, Robert S., Assoc. Director
Cookson, Albert E., Assoc. Lab. Director
Levine, Arnold, Director, Guided Missile Laboratory
Press, Martin, Sr. Proj. Engr.
Waer, Richard R., Executive Engr.

ERNEST F. FETSKE & CO., ESSEX, CONN.

Fetske, Ernest F., President

FIRESTONE TIRE & RUBBER COMPANY, AKRON, OHIO

Berus, Edward R., Physicist
Davies, William O., Physicist

Los Angeles, Calif.

Bray, Richard A., Supervisor, Systems' Group, Electronics Prod. Engng. Sec.
Christensen, Niels G., System Analyst
Clabby, John T., Sr. Engng.
DesLaurier, Emile J., Field Serv. Engr.
Ellis, Al, Prod. Electronic Engr.
Fellion, Glenn R., Sr. Proj. Eng. Guided Missile Div.
Gelo, Joseph W., Systems Electronic Engr.
Gerkin, Donald E., Engr.
Gibson, Hubert I., General Mgr.
Hedberg, James H., Leader-Propusion Grp.
Helfrich, James F., Sr. Electronics Engr.
Hurst, William F., Electronic Engr.
Kemper, Donald M., Electron Design
Knight, Charles A., Proj. Engr., Structures
Kuntz, Robert F., Factory Mgr.

Lee, David A., Design Engr.
MacDonald, Frank W., Chief Engr.
McCord, William M., Chief, Electronic Engr.
McHugh, Walter M., Sr. Electronic Engr.
Moore, Beal P., Guided Missile Div.
Nathe, Robert U., Supervisor, Electronic Systems Section
Rhode, C. W., Assist Supr., Production Electronics Engr.
Robert, Lee Palmer, Sr. Draftsman
Schwager, William P., Mgr.
Stephens, Floyd R., Jr., Field Engr.
Williams, Kirk, Field Engr.

**FISCHER AND PORTER CO.,
HATBORO, PENNA.**

Haupt, Frank P., Application Engr.
Shapcott, Ralph L., Mgr., Flowmeter Div.
Stern, Robert K., Vice President
Wapner, Joseph F., Chief Engr.

**FLETTNER AIRCRAFT CORP.,
KEW GARDENS, N. Y.**

Liberatore, Eugene K., Assist. Director of Engng.

FLIGHT ENGINEERS' INTERNATIONAL ASS'N., AFL-CIO,

Kent, William D., President

**FLIGHT REFUELING, INCORPORATED,
BALTIMORE, MD.**

Newhall, Charles W., Jr., President and Treasurer

**FLIGHT RESEARCH, INC.
RICHMOND, VA.**

Curdts, William T., III, Vice President & Gen. Mgr.

**FOBER & ASSOCIATES,
CHICAGO, ILL.**

Fober, Frederick C., Industrial Training Consultant

**FOGGING & DUSTING SERVICE, INC.,
UPPER MONTCLAIR, N. J.**

Cochran, Alexander M., President

**FOLEY BROS. DRY GOODS CO.,
HOUSTON, TEXAS**

Shiffick, William, Vice President, Operations & Control.

**FOOD MACHINERY AND CHEMICAL CORP.,
SAN JOSE, CALIF.**

Hait, James M., Vice President; Manager of Ordnance Division
Wilbur, Paul C., Dir. of Res. & Vice Pres.

Becco Chemical Div.

Bloom, Ralph, Jr., Proj. Supvr.
Cox, George E., Proj. Engr.
Davis, Noah S., Mgr. Special Projects
Flach, Donald O., Project Engr.
Gilbert, Frederick A., Assist. Division Mgr.
Kauffmann, Hans O., Techinal Director
Keefe, John H., Proj. Supv.
Shanley, Edward S., Assist. Tech. Director
Weinberg, Elliot K,. Project Engr.

New York, N. Y.

Prutton, Carl F., Vice President & Tech. Director

Westvaco Chlor-Alkali Div.

Rose, William B., Mgr., Research & Devel. Division

**FORD INSTRUMENT CO., DIV. OF SPERRY RAND CORP.,
LONG ISLAND CITY, N. Y.**

Brown, Lawrence S., Staff Proj. Engr.
Garrett, Elmer E., Engng. Director for Ground Equipment
Jahn, Raymond F., President & Gen. Mgr.
McKenney, Henry, Chief Engr.
Scheuer, Lewis J., Proj. Supervisor
Slawson, Kenneth, Vice President
Weber, William F., Mgr.

FORD, MOTOR CO.,
DEARBORN, MICH.
Craig, David J., Res. Engr.
Egli, Adolf, Mgr., Basic Engng. Department
Ference, Michael, Jr., Assoc. Director, Scientific Laboratory
Frey, Donald N., Assoc. Director, Scientific Laboratory.
Hill, Eugene F., Manager, Chemistry Dept.
Krueger, Frederick G., Engr.
Kucher, A. A., Director

Chicago, Ill.
Sawicki, Stephen M., "A" Process Engr.
Smith, Sanford R., Engng. Reports & Compuations Supervisor
Vannelli, Renso John, Sr. Engr.

FRANCISCO ENGINEERING CO.,
ALBUQUERQUE, N. M.
Francisco, Edward E., Jr., President

FRANKLIN INSTITUTE,
PHILADELPHIA, PA.
Levitt, I. M., Director, The Fels Planetarium
Streeter, John W., Assist Director, Fels Planetarium

FREBANK CO.,
GLENDALE, CALIF.
White, Gene H., Vice President, Admin.

THE FRYE CORPORATION,
FT. WORTH, TEXAS
Snowden, Earl, Stress Analyst

FUJI PRECISION MACHINERY CO., LTD.,
TOKYO, JAPAN
Nakagawa, Ryoichi, Director and Mgr., Engng.

FUTURECRAFT CORPORATION,
EL MONTE, CALIF.
Burke, Robert W., Engr.
Chilcoast, Murray M., Design Engr.
Koutnik, Rod, Engr.
Piet, Meyer, President

G. W. GALLOWAY CO.,
ARCADIA, CALIF.
Galloway, George W., President

JAMES C. GALLOWAY & COMPANY
LOS ANGELES, CALIF.
Galloway, James C., Owner
Harbison, Joseph W., Sales

GARRETT CORPORATION,
LOS ANGELES, CALIF.
Aero Engineering Co.,
Baltimore, Md.
Crotty, Walter J., Jr., Engr.

Mineola, N. Y.
Aderton, Thomas R., Installation Engr.

AiResearch Aviation Service Co.,
Los Angeles, Calif.
Drexel, Charles F., Proj. Engr.
Dutton, Roy A., Staff Assist. to Exec. V. P.
Oldaker, Carl R., Field Service Engr.
Phelan, Arthur J., Assist. to V. P. in Charge of Engng.
Ramsaur, Walter R., Vice Pres.ident
Sergeyevsky, Andrey B., Stress Engr.
Wimpress, Donald S., Devel. Engr.

Phoenix, Ariz.
King, Leighton S., Chief Preliminary Des. Engr.

GAZDA ENGINEERING,
CRANSTON, R. I.
Gazda, Antoine, President

GELB ENGINEERING CO.,
BUFFALO, N. Y.
Gelb, John, Owner

GENERAL ASTRONAUTICS CORPORATION,
OYSTER BAY, N. Y.
Canney, Heyward E., Jr., President
Ordway, Frederick I., III, Exec. Vice Pres.

GENERAL BLOWER CO., MORTON GROVE, ILL.

Williamson, C. Glen, Executive Vice Pres.

GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

Adamson, Arthur P., Mgr. Advanced Engng.
Bowman, Kenneth K., Engr., Atomic Power Study
Buchhold, Theodor, Consulting Engr.
Cockrell, William D., Control Elec. Engr.
Corriveaux, Frank, Foreman
Cowles, Logan B., Mgr., Structures & Auxiliaries Engr.
Crawford, Samuel W., Requisitions Engr.
Duryea, John B., Development Engr.
Eckert, Fayette, Test Man
Flamm, Henry F., Engr.
Giragosian, Pakrad Antar, Aero-Thermodynamisist
Goldman, Richard G., Engr.
Green, Charles F., Mgr., Advance Devel.
Haviland, Robert P., Flight Test Planning Engr.
Hoffman, Joseph C., Mgr., Product inform.
Hull, Edwin H., Res. Associate.
Lantz, Edward A., Engr.
Linnell, Richard D., Functional Engr.
MacLeod, John H., Supervisor, Tech. Personnell Dev. & Placement
Mattison, Keith W., Proj. Planning Engr.
Moore, George E., Res. Associate
Mullen, Donald E., Sales Engr.
Norris, R. Hosmer, Consulting Engr.
Ogle, Hugh Malcolm, Mgr.-Control Systems Engng.
Orsino, Anthony, Engr.
Petty, Thomas M., Jr., Mgr., Equipment Engng.
Rieger, George F., Engr., Guided Missiles Dept.
Ruggiero, Daniel J., Technical Specialist
Schmidt, E., Consultant
Schreib, Rolland R., Jr.
Swartz, Theodore C., General Elec. Res. Lab.
Warren, Walter R., Engr., Advanced Aero-Thermodynamics Experimentation
Weinstein, Jack J., Aerodynamics Performance Engr.

Anchorage, Alaska
George, Ralph C., Alaska Regional Supvr.

Ballston Spa, N. Y.
Berman, Kurt, Act. Supervisor-Combustion Devel. Unit-Advanced Engng.
Brown, Albert B., Supvr. of Facilities
Finger, Elmer I., Test Supvr.
Halladay, John W., Engr.
Kleczek, Walter S., Supvr.—X-405, Devel. Unit
Neuffer, Bruce H., Supvr.-Preliminary Design Unit
Schultz, Frederick E., Supervisor Component Develop.
Teague, Thomas S., Mgr., Malta Operations
Walker, Frank J., Engr., Thrust Chamber Injectors

Burlington, Vt.
Ashley, Eugene, Prod. Design Engr.

Chicago, Ill.
Coleman, Henry B., Mgr.

Cincinnati, Ohio
Babington, Emerson Lee, Tech. & Cutter Grinder
Beverage, Allan D., Rocket Engine Planning Engr.
Blevins, Kenneth L., Devel. Eng. Prod.
Botje, Jacobus M., Proj. Engr.
Brown, David M., Mgr.
Brown, Fred I., Jr., Mgr., Rocket Eng. Sales
Cheney, Samuel H., Jr., Engr.
Cochran, David, Gen. Mgr.
Cohen, Herbert L., Engr.
Cole, Ray, Lab. Assist.
Cooley, William C., Prin. Engr.
Danforth, Clarence E., Stress-Vibration Consulting Engr.
Delson, Erwin B., Proj. Engr.
Dennis, Bernard K., Presentation Specialist
Dickerson, Melvin R., Technical Writer
Dowell, Millard F., Fluid Dynamics Engr.
Emmons, George S., Supvr., X-405 Engng.
Exselsen, Carl H., Tech. Eng. (Design)
Gorse, Norville J., Technical Engr.
Grosch, Herbert R. J., Mgr., Investigations Section
Hacker, David S., Thermal Kneticist
Heismann, James A., Engng. Assist.
Kappus, Peter G., Mgr., New Product Planning
Lonon, David N., III, Engr.
Lype, Eric F., Thermodynamicist
Macpherson, George L., Engr.
Marino, Vincent P., Lab. Tech.
Meloy, Thomas Phillips, Specialist, Water Injection
Michaelson, Louis, Mgr., Rocket Engine Section
Mueller, Donald
Nelson, John R., Program Eng.
Olson, Robert K., Placement Specialist
Pietsch, Anthony, Tech. Engr.
Reece, Judson B., Instrument Tech.
Schapker, Richard L., Design Engr.
Schnoor, Fred W., Engng. Assist.
Shaw, John R., Engr.
Sheldon, Zachary D., Propellants Research Specialist
Shufelt, Charles E., Tech. Engr.
Stewart, Richard P., Supervisor
Stockwell, Richard E., Tech. Communications Specialist
Suciu, Spiridon N., Mgr., App. Res. Dept.
Summers, Charles S., Engr.
Szekely, Thomas, Engr. (Nuclear)
Tait, Robert, Engr.
Taylor, Ralph Wayne, Engng. Assist.
Thomas, Nicholas T., Engr.
Thomson, Wallace B., Design Analyst
Travers, William R., Mgr. of Marketing
Trupin, Carol Ann, Engng. Assist.
Wagner, Charles E., Photographer
Weber, Harold M., Jr., Supervisor
Weisberger, Harold, Technical Engr.
Welch, William W., Eng.
Whitehead, Robert F., Tech. Engr.
Williamson, Robert C., Devel. Engr.
Worsham, James E., Devel. Engr.
Wrede, Don E., Quality Assurance Inspector
Wright, John B., Test Design Engr.
Zubko, Leonard M., Mgr.

Dallas, Texas
Bingham, James J., Mgr., Aircraft Engines

Dayton, Ohio
McTigue, George J., Mgr., Aircraft Engine Sales

Idaho Falls, Idaho
Crocker, Albert R., Mgr., Test Operations
Orillion, Alfred G., Tech. Engr.

Ithaca, N. Y.
Youtcheff, John Sheldon, Physicist

Johnson City, N. Y.
Bouey, Ernest A., Engr.

Los Angeles, Calif.
Heidack, John M., Mgr., Aircraft and Weapons Systems

Lynn, Mass.
Michel, Leopold R., Mgr., Project Objectives & Advance Engng.
Minichello, Raymond
Richter, Ralph P., Tech. Prod. Dept. Mfng., Trainee
Smith, Chester W., Tech. Adviser, Aircraft Gas Turbine Div.

Middletown, Ohio
White, Warren A., Technical Representative

Newark, N. J.
Jansson, John H., Turbine Installation Supvr.

New York, N. Y.
Duff, Richard A., Consultant, Operations Research & Synthesy
LaPierre, Cramer W., Vice Pres., Electronic, Atomic & Defense Systems Group
Porter, Richard W., Consultant, Engng. Ser.

Peebles, Ohio
White, Leo D., Mgr., Proving Ground

Philadelphia, Pa.
Cooper, Frederic M., Prop. Engr.
Kennett, Howard W., Product Information Specialist

Pittsfield, Mass.
Bujac, James N., Jr., Mech. Design Engr.

Seattle, Wash.
Brown, Keith R., Engr.

Syracuse, N. Y.
Hom, Stephen, Field Engr.
Mangum, Buford A., Advertising & Sales Promotion

Utica, N. Y.
Grisetti, Robert S., Supervisor
Macdonald, Virginia, Engng. Assist.
Meyn, Frederick W., Supervisor, Product Design
Wolfe, Gibson M., Systems Engr.

Washington, D. C.
Fridell, Roland, Aircraft Eng. Specialist
Hansell, Haywood S., Sr. Consultant
Donald, R. Rodgers, Sales Engr.

Waynesboro, Va.
Duncan, Phillip L., Product Planning Specialist

Wichita, Kansas
Ward, George H., Specialist, Aircraft Eng.

GENERAL MILLS, INC., MINNEAPOLIS, MINN.

Baller, Howard, Mgr.
Barkley, John E., Mgr.
Buffington, John W., Res. Engr.
Geick, George H., Assist. Mgr., Systems Dept.
Kober, Carl L., Mgr., Systems Dept.
Wehner, Gottfried K., Physicist

GENERAL MOTORS CORPORATION, DETROIT, MICH.

A-C Spark Plug Div.
Howard, John R., Special Assignment Engr.
Schlager, Kenneth J., Proj. Engr.

Allison Div.
Aspinwall, Robert H., Sr. Proj. Engr.
Gerdan, Dimitrius, Director of Engng.
Hall, Russell S., Section Chief, Preliminary Design & Development
Heaton, Thomas R., Sr. Proj. Engr.
Knott, James E., Assist. Mgr., Aircraft Sales & Contracts
McDowall, Charles J., Chief Engr., Advance Design and Development
Schumann, William A., Field Engr.
Wheatley, John B., Assist. Chem. Engr.

THE GENERAL TIRE & RUBBER CO., AKRON, OHIO

Antonio, Adolph L., Gen. Mgr.
Bolster, Calvin M., Co-ordinator of Devel.
Moore, Robert E., Draftsman
O'Neill, W., President and Chairman of the Board
Pfeiffer, Paul O., Mgr.

Washington, D. C.
Fiala, William A., Washington Rep.
Tharp, Thomas A., Washington Rep.

GENISCO, INC. LOS ANGELES, CALIF.

Barton, William A., Director, Sales & Contracts
Brown, Ralph E., Chem. Engr.
Burkhart, Ernie C., President
Custer, Randall M., Prod. Mgr.
Tikanen, William A., Instrument Engr.

GEO-SCIENCE, INC., ALAMOGORDO, N. M.

Jones, June G., Res. Physicist

G. M. GIANNINI & CO., PASADENA, CALIF.

Gero, Doane R., Vice Pres., Airborne Oper.

Giannini, Gabriel M., President
Oman, William S., Director of Sales
Gilliland, William L., President
Gilpin, Robert D., President

GLAR-BAN CORP., BUFFALO, N. Y.

Hill, Robert B., President
Roggan, Francis J., Engng., Vice President

B. F. GOODRICH CHEMICAL CO., CLEVELAND, OHIO

Alexander, Claude H., Mgr. Product Devel.
Miller, Ernest J., Coordinator-Defense Contracts

Avon Lake, Ohio

Waugaman, Charles A., Development Engr.

THE B. F. GOODRICH COMPANY, WASHINGTON, D. C.

Marshall, Fred T., Director, Federal Govt. Relations

GOODYEAR AIRCRAFT CORPORATION, AKRON, OHIO

Couts, Robert J., Mgr., Design Engr.
Feldscher, John C., Section Head, Rocket Prop. Engr.
Gaul, Edward R., Missile Guidance Consult.
Hardie, James E., Specifications Group Leader
Hiltz, William F., Electronic Eng.
Hinks, William L., Sr. Development Engr.
Hoffman, Thelma, Design Checking
Knight, Richard E., Head, Aerodynamics Section
Miller, James H., Engr. Specialist, Aerophysics Dept.
Minor, Howard G., Engr.
Peters, Wesley H., Aerophysics Dept.
Romick, Darrell C., Staff Engr., YTM-61B Project
Scott, Charles N., Development Engr.
Smith, Boyd L., Sr. Designer-Structures
Straw, Clayton L., Weight Engr.
Toman, William, Development Engr.
Wiant, Wayne E., Missile Specifications Engr.
Yanculeff, Cornelia, Artist-Cartographer
Zipkin, Morris A., Chief Thermodynamicist

Holloman AFB, N. M.

Tubridy, Edward H., Electronic Engr.

GOODYEAR TIRE & RUBBER CO., AKRON, OHIO

Conger, Marvin T., Research Chem. Engr.
Osterhof, H. Judson, Dir. of Research
Wilson, Warren K., Research Chemist

GORDON ENTERPRISES, NO. HOLLYWOOD, CALIF.

Gordon, Alan, Owner

GORN ELECTRIC CO., INC., STAMFORD, CONN.

Morgan, A. Henry, Gen. Mgr.

GRAND CENTRAL AIRCRAFT CO., GLENDALE, CALIF.

Moseley, Corlis C., Pres. & Chairman of Board

GRAND CENTRAL ROCKET CO., REDLANDS, CALIF.

Ahern, Robert E., Sr. Proj. Engr.
Bartley, Charles E., President
Batchelder, George W., Prin. Chemist
Elder, John Kendall, Proj. Chemist
Schaafsma, William, Chief Engr.
Settlemire, Larry, Production Mgr.
Stickney, Herbert H., Director of Admin.
Thackwell, Henry L., Assist. President
Waxman, Stanley, Director of Res. and Development
Weitzel, Winfield, Tech. Rep.

GRANT ADVERTISING, NEW YORK, N. Y.

Johnston, Thomas E., PR Account Exec.

THE GRATIOT ENGINEERING COMPANY, WOODSTOCK, VERMONT

Gratiot, John P.

GRAY RESEARCH & DEVELOPMENT CO., INC. MANCHESTER, CONN.

Hayes, Chester B., General Sales Mgr.

GREAT LONDON RUBBER COMPANY, ENGLAND

Ross, T. Melville

THE GREENLEAF MANUFACTURING CO., ST. LOUIS, MO.

Boman, William T., Development Engr.
Gahn, Edwin H., Operations Mgr.
Greenblatt, Louis W., President
Volk, Joseph A., Director of Research
Zak, Stanley J., Engng. Mgr.

GROVE CONTROLS, INC., LOS ANGELES, CALIF.

Stephens, Arnold H., Application Engr.

GROVE VALVE & REGULATOR CO., OAKLAND, CALIF.

Bryant, Austin U., Chief Engr.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION BETHPAGE, N. Y.

Bauman, Robert P., Eng. Dept.
Converse, Courtland B., Aero-Hydrodynamicist
Gayne, William J., Design Trainee
Smedfjeld, John B., Flutter and Vibration Engr.
Viemeister, Peter E., Prelim. Design Engr.

HALEY, DOTY & WOLLENBERG, WASHINGTON, D. C.

Bader, Michael H., Attorney
Haley, Andrew G., Attorney-at-Law
White, Ethna A., Secretary and Office Mgr.

HANLON & WILSON CO., PITTSBURGH, PA.

Wilson, John R., President

HARVEY MACHINE COMPANY, TORRANCE, CALIF.

Anderson, Paul E., Chief Engr., Res. & Devel. Dept.
Evans, Paul I., Proj. Engr., Ord. Res. & Devel.
Thomas, Harold E., Engr.
Owens, Ralph

Los Angeles, Calif.

Harvey, Herbert, Vice President
Harvey, Homer M., President

HASKEL ENGINEERING & SUPPLY CO., GLENDALE, CALIF.

Hayman, Richard L., President
Driskel, Don W., Partner

HAYES AIRCRAFT CORP., BIRMINGHAM, ALA.

Weir, John L., Assist. Group Engr.

HAYNES STELLITE CO., KOKOMO, IND.

Badger, F. Sidney, Jr., Vice President
Chisholm, Charles G., Mgr. Sales Devel.

Los Angeles, Calif.

Boericke, Frederic S., District Sales Mgr.
Calhoun, William D., Sales Engr.

New York, N. Y.

Harris, Albert Victor, Eastern Sales Mgr.

HEINTZ MFG. CO., PHILADELPHIA, PA.

Bernstein, Abe, Director, Rocket Launcher Devel.

HENRY PRODUCTS COMPANY, BROOKLYN, N. Y.

Levenson, Robert S., Mech. Engr.

HERCULES POWDER COMPANY, WILMINGTON, DEL.

Bonner, Lyman G., Mgr.
Hakenjos, Fred M., Mgr., Smokeless Powder Sales

Cumberland, Md.

McKinney, C. Dana, Jr., Technical Director

Kenvil, N. J.

Giacco, Alexander F., Tech. Supt.

Radford, Va.

Main, John H., Tech. Director

HERRING-HALL-MARVIN SAFE CO., HAMILTON, OHIO

Holbrock, Edward F., Jr. Engr.

HETT ASSOCIATES, INC., ENGLEWOOD, N. J.

Hett, John H., President

HETTLEMAN CORP., NEW YORK CITY

Scheinman, Robert L., President

HEWITT-ROBINS, INC., STAMFORD, CONN.

Sarbach, Donald V., Director of Research

HIGH VOLTAGE ENGINEERING CORP., CAMBRIDGE, MASS.

Gale, Alfred J.

WILLIAM E. HILL & CO., INC., NEW YORK, N. Y.

Tuckerman, Maj. Gen. Alfred G., Assoc. Engr.

HILLER HELICOPTERS, PALO ALTO, CALIF.

Messinger, Carl W., Jr., Project Engr.

CHARLES E. HIRES CO., SEATTLE, WASH.

Binet, Ludger J., General Mgr.

R. W. HODGSON CO., LOS ANGELES, CALIF.

Hodgson, R. W., Director of Res. & Devel.

HOFFMAN LABORATORIES, INC., LOS ANGELES, CALIF.

Bush, William R., Assist. Gen. Sales Mgr.
Clark, Thomas C., Chief of Tech. Planning
Downes, Lloyd C., Head Res. Dept.
Moss, John B., President
Wasmansdorff, C., Vice Pres., Engng.

HORNING-COOPER, INC., MONROVIA, CALIF.

Zimney, Charles M., Chief Engr.

HOTPOINT COMPANY, CHICAGO, ILL.

Mahoney, Edward A.

W. T. HOWALD MACHINE WORKS, BROOKLYN, N. Y.

Yih, Wei Hung, Mech. Engng. Designer

HUGHES AIRCRAFT COMPANY, CULVER CITY, CALIF.

Anderson, Aubrey M., Technical Staff
Anderson, Elmer C., General Supvr., Aircraft Mfgng. Div.
Bariffi, Herbert F., Technical Staff
Bassett, Denison S., Operations Sec. Head
Beebe, Murray C., Head, Propulsion Dept.
Broughton, S. A., Technical Staff
Byron, Thomas J., USAF Assist Gen. Supvr.
Carvey, Tom B., Assist. Head, Propulsion Dept.
Drebinger, John W., Member, Tech. Staff
Ellmore, Lewis F., Member of Tech. Staff

Flaherty, William J., Technical Staff
Ghastin, Robert W., Member Tech. Staff
Heacock, Robert H., Engr.
Heimiller, Robert, Member Tech. Staff
Hendren, Eugene E., Member Tech. Staff
Hess, Frederick W., Director of Customer Relations
Jazwiec, Earl A.
Jones, Robert W., Technical Staff
Kaplan, Maxwell H., Technical Staff (Metallurgy)
Lewis, Albert C., Military Sales Rep.
Maucieri, John J.
Mahaffy, Dwight A., Research Engr.
McClintock, Darwin G., Research Engr.
Pegg, William J., Engng. Coordinator
Pieroni, Verdy J., Jr., Technical Staff
Preece, Raymond G., Tech. Liaison Engr.
Reich, Herbert, Technical Staff
Remy, Richard T., Technical Staff, Radar R&D Div.
Roney, Robert K., Head of Dept.
Sears, Robert E., Assist. Head, Prop. Dept.
Shapero, Albert, Research Engr.
Stevens, Phillip J., Technical Staff
Stoolman, Leo, Head, Aerodynamics Dept.
Teichmann, Caroline Swift, Technical Staff
Tocco, Anthony R., Member Tech. Staff
Wangsgard, Alton P., Project Mgr.

Los Angeles, Calif.
Burnell, Edwin J., Head, Engr. Services Section

Tucson, Ariz.
Barringer, Elmer E., Electronic Engr.
Bellis, Howard E., Tool Engr.
Delamater, Edward J., Manufacturing Engr.
Green, Charles J., Estimating Engr.
Lim, David P.
Hacker, George T., Proj. Test Engr.
Phillips, Robert F., Inspector Bearings
Shuman, Robert M., Sr. Project Test Engr.
Singer, Joel I., Precision Asembler
Tannous, Philip, Jr., Quality Test Planning Engr.
Wade, Sydney L., Foreman
Walton, Lynn H., Technical Staff

HYCON MFG. COMPANY,
PASADENA, CALIF.
Acker, Alden E., President

Washington, D. C.
Brennan, Daniel C., Washington Rep.

HY-GRADE PAPER CO.,
BUFFALO, N. Y.
Kareff, Joseph D., Bookkeeper

ILLINOIS TOOL WORKS,
ELGIN, ILL.
Rosenberger, Paul E., Electroplater

INDIALANTIC HOTEL CORP.,
MELBOURNE, FLA.
Doherty, Thomas J., President-Director

INDUSTRIAL ENG. RES.,
FT. WORTH, TEXAS
Nordyke, S. E., Project Engr.

INDUSTRIAL PRODUCTS ENGNG. Co.,
LONG ISLAND CITY, N. Y.
Somers, John C., President

INSTITUTE OF AMERICAN INVENTORS,
WASHINGTON, D. C.
Mann, Clarence H., Secretary

INSTITUTE OF THE AERONAUTICAL SCIENCES, INC.,
NEW YORK, N. Y.
Johnston, S. Paul, Director

INTERNATIONAL BUSINESS MACHINES CORP.,
NEW YORK, N. Y.
Rossoni, Giampiero, Instructor IBM Electronic Calculators (Methods)

Alamogordo, N. M.
Pierce, Geo. E., Engr.-in-Charge

Cambridge, Mass.
Hunter, G. Truman

Philadelphia, Pa.
Mondrosch, John A., Customer Engr.

Poughkeepsie, N. Y.
Short, William P.

INTERNATIONAL ENGINEERING CO., INC.,
SAN FRANCISCO, CALIF.
Hewitt, Harvey G., Civil Engr.

INTERNATIONAL HARVESTER,
FT. WAYNE, IND.
Spahr, David P., Laboratory Tech.

INTERNATIONAL MAP CO.,
NEW YORK, N. Y.
Wells, William D., Vice President

INTERNATIONAL TELECOMMUNICATION UNION,
GENEVA, SWITZERLAND
Gross, Gerald C., Captain USNR

INTERSTATE ENGNG. CORP.,
EL SEGUNDO, CALIF.
Birrer, Lloyd G., Project Engr.

IRON FIREMAN MANUFACTURING CO.,
PORTLAND, ORE.
Breese, Vance, Director Gyro Program

IRVING AIR CHUTE CO., INC.,
LEXINGTON, KY.
Irvin, Leslie L., President

JACKSON CHINA CO.,
FALLS CREEK, PENN.
Allen, Robert W., Design Engr.

JOHNSEN DESIGN SERVICE,
W. ORANGE, N. J.
Johnsen, Kenneth, Mech. Designer

JOHNS-MANVILLE CORP.,
NEW YORK, N. Y.
Briggs, Edward F., Mgr.
Hinmon, Don L., Vice Pres. & Gen. Mgr.

CORYDON M. JOHNSON CO., INC.,
BETHPAGE, L. I.
Johnson, Corydon M., President
Short, Leslie B., Technical Acct. Executive

JOHNSON & JOHNSON,
NEW BRUNSWICK, N. J.
De Ford, Harold L., Chem. Engr.

HERRICK L. JOHNSTON, INC.
COLUMBUS, OHIO
Johnston, Herrick L., President
May, Claude H., Project Engr.

KAISER METAL PRODUCTS, INC.
BRISTOL, PA.
Cudhea, George G., Assist. Mgr., Fleetwings Div.
Northrup, Arvin, Military Sales Rep.
Ogden, Albert S., Chief Engr.
Rigney, Henry J., Aircraft Quality Inspector Leadman

KAMAN AIRCRAFT CORP.,
BLOOMFIELD, CONN.
Marchese, Joseph H., Electronic Engr.
Miale, Charles V., Aerodynamicist
Mitton, Robert L., Test & Devel., Engr.
Nessen, John W., Assist. Supervisor, Publications
Stevens, Martin L., Chief of Prelim. Design

KEARFOTT CO., INC.,
LITTLE FALLS, N. J.
Collen, Edwin G., Project Engr.
Osladil, Stanley, Project Engr.

KELLETT AIRCRAFT CORP.,
CAMDEN, N. J.
Pruyn, Richard R., Aerodynamicist

M. W. KELLOGG CO.,
JERSEY CITY, N. J.
Barzelay, Arthur R., Div. Engr.
McKiernan, James D., Project Engr.
Miller, K. Dexter, Jr., Division Engr.
Peterson, Howard S., Division Engr., Design Rocket Design Division
Taylor, John S., Mgr. of Rocket Sales
Walsh, Frank Van Wormer, Sr. Proj. Engr.
Withey, James T., Project Engr.

New York, N. Y.
Yachter, M., Sr. Engr., Devel. Div.

KELSEY-HAYES WHEEL CO.,
DETROIT, MICH.
Taylor, Leslie G., Dir. of Defense Sales

Jackson, Mich.
MacGregor, Ross R., Chief, Aircraft Process Engr.

Los Angeles, Calif.
Hoffman, Frank E., Mgr., West Coast Aircraft Sales & Engng.

Springfield, Ohio
Meredith, Charles Palmer, Vice President and Gen. Mgr.
Alexander, William R., Director of Engng.

KETT CORP.,
CINCINNATI, OHIO
Scott, Judson F., Chief Proj. Engr.

WALTER KIDDE & CO., INC.,
BELLEVILLE, N. J.
Masnik, Walter, Project Engr.

KIDDIE PRECISION TOOL CORPORATION,
ROSELAND, N. J.
Mollek, Joseph W., Vice President, Mgr., Special Products Div.

KIMURA BROS.,
SEATTLE, WASH.
Kimura, Minoru, Senior Partner

KING BROADCASTING COMPANY,
SEATTLE, WASH.
Bullitt, Dorothy S., President

KIRK ENGINEERING CO.,
ARCADIA, CALIF.
Ivan, Joseph M., Design Engr.

KISTLER INSTRUMENT CO.,
TONAWANDA, N. Y.
Kistler, Walter P., President

KOLLSMAN INST., CORP.,
ELMHURST, N. Y.
Angst, Walter, Chief Engr.
Schaefer, Herbert, Project Engr.

KOPPERS CO., INC.,
BALTIMORE, MD.
Naylor, Thurman F., Mgr. Contracting Dept., Metal Products Div.

Industrial Sound Control Dept.,
Hartford, Conn.
Lemmerman, Carl W., Consultant

Pittsburgh, Pa.
Ramella, Frank O., Shift Foreman, Chemical Division

Verona, Pa.
Martini, Joseph C., Chemist

LAND-AIR, INC.,
HOLLOMAN AFB, N. M.
Helstrom, Gilbert R., Electronic Tech. "A"
Stucky, Curtis, Technician

LANSDALE TUBE COMPANY,
LANSDALE, PENN.
Binelli, Walter D., Elec. Engr.

LEACH CORP.,
LOS ANGELES, CALIF.
Bradley, S. LeRoy, Engr.
Elliott, James L., Assist. to Gen. Mgr.
Hutton, R. B., Vice President Sales
Julin, Kenneth F., Exec. Vice Pres. and Gen. Mgr.
Neale, E. K., V. P. Engng.

LEAR INC.,
SANTA MONICA, CALIF.
Breitwieser, Charles J., Vice Pres., Gen. Mgr.

Elyria, Ohio
Atkinson, Russell S., Contracts Mgr.

LEBANON STEEL FOUNDRY,
LEBANON, PA.
Platt, Edward H., Jr., Mgr., Alloy Sales

LEHIGH ENGINEERING ASSOCIATES,
NEWARK, N. J.
Lagunow, Alexander, Designer "C"

LIBERTY PRODUCTS CORPORATION,
FARMINGDALE, L. I., N. Y.
Hauser, George H., Vice President

LINDE AIR PRODUCTS CO.,
NEW YORK, N. Y.
Zimmerman, John H., Mgr., Develop. Engng.

Los Angeles, Calif.
Fallon, Clifford T., Sales Engr.

Newark, N. J.
Farnsworth, Walter B., Mgr.
Job, Frederick R., Jr., Proj. Engr., Jet Flame Applications

Tonawanda, N. Y.
Burger, George S., Abrasive Tech.
McCandless, Edward L., Assist. Dir. of Res.
Smith, George Harvey, Res. Associate
Thorpe, Merle L., Res. Engr.

LION OIL CO.,
EL DORADO, ARK.
Spillane, Leo J., Mgr., Organic Chem. Research

ARTHUR D. LITTLE, INC.,
CAMBRIDGE, MASS.
Bolin, Richard L.
Durant, Frederick C., III, Staff Member
Gifford, William E., Engr.
Harvell, John T., Mech. Engr.
Manion, Kathleen M.
Nussdorfer, Theodore J., Jr., Res. Engr.
Sawyer, Winslow A.
Sweeney, George C.

Los Angeles, Calif.
Mesick, Benjamin S., Sr. Staff Engr.

Washington, D. C.
Jewett, C. Lincoln, Mgr., Washington, D. C. Office

LOCKHEED AIRCRAFT CORP.,
BURBANK, CALIF.
Childers, Milford G., Structural Requirements Dept.
George, Dino, Associate Engr. Stress
Michielsen, Herman F., Structures Engr.
Root, L., Eugene, Dir. of Devel. Planning
Thomas, Charles F., Corporate Director of Mil. Sales
Wassall, John B., Dir. of Engng.
Zwemer, Howard A., Devel. Planning Spec.

Holloman AFB, N. M.
Tomson, Alfred G., Res. Engr.

Marietta, Ga.
Bush, Powell D., Jr., Res. Engr., Aircraft
Middlewood, Robert W., Chief Engr.
Townsend, Thomas H., Aerodynamics Engr. Senior

Palmdale, Calif.
Coleal, William A., Flight Test Engr.

Van Nuys, Calif.
Abramoski, James W., Research Engr.
Bignon, Andre P., Research Engr.
Bridges, Willard A., Military Coordinator
Byers, Richard A., Research Engr.
Carhart, Richard, Dept. Engr.
Culver, Irving, Engr.
Dann, Joseph A., Research Engr.
Dessler, Alexander J., Sr. Scientist
Ellis, Bernard, Head of Propulsion Dept.
Fogel, Irvin N., Accountant
Freeman, George B., Staff Engr.
Grossklaus, Albert A., Research Engr.
Hagenmaier, Carl F., Military Coordinator
Hawkins, Willis M., Director of Engng.
Jonas, Julius, Staff Engr.
Kindsvater, Howard M., Staff Scientist
Kinghorn, George F., Dept. Engr.
Mason, Lemuel W., Jr., Group Engr.
Misenhimer, James T., Design Engr.
Naegele, Robert J., II, Staff Engr.
Noeggerath, Wolfgang C., Res. Specialist
Rattin, Egan J., Research Engr.
Salter, Robert M., Jr., Head, Special Systems Dept.
Sherman, Harvey, Structures Engineer
Stirman, Marion W., Electrical Engr., Design "A"
Swanson, Robert S., Dept. Manager
Taulbee, Preston L., Research Spec.
Vigil, Juan G., Mech. Engr., Missile Systems Div.
Vinokur, Marcel, Research Scientist
Wakefield, Charles W., Military Coordinator
Wickersham, Robert O., Dept. Mgr.
Wunch, William S., Research Specialist
Wright, William F., Staff Engr.

LOGAN ENGINEERING CO.,
CHICAGO, ILL.
Logan, Stanley E., Engr.

LOS ALAMOS SCIENTIFIC LAB.,
LOS ALAMOS, N. M.
Everett, Cornelius J., Staff Member

Gittings, Homer T., Jr., Staff Member
Simmons, Stanley H., Staff Member

LOVELACE FOUNDATION FOR MEDICAL EDUCATION & RESEARCH, ALBUQUERQUE, N. M.

Lovelace, Randolph W., II, Director

LOWENJON LABORATORIES, INC., BUFFALO, N. Y.

Nowak, John J., President

LYNCH, HART & STOUKTON ADVERTISING, CLAYTON, MD.

Adams, Rose, Prod. Mgr.

MAGNAVOX CO., FT. WAYNE, IND.

Craig, Donald E., Assist. Mech. Engr.
Sullivan, Walter H., Engr.

MANNING, MAXWELL & MOORE, INC., DANBURY, CONN.

Meisenheimer, Daniel T., Devel. Engr.

MANUFACTURERS AIRCRAFT ASSOCIATION, INC. NEW YORK, N. Y.

Clark, James M., Assist. Gen. Mgr.

MARMAN PRODUCTS COMPANY, INC., LOS ANGELES, CALIF.

Deacon, William S., Missile Sales Mgr.

MAROTTA VALVE CORP., BOONTON, N. J.

Marotta, Patrick T., President

MARQUARDT AIRCRAFT CO., VAN NUYS, CALIF.

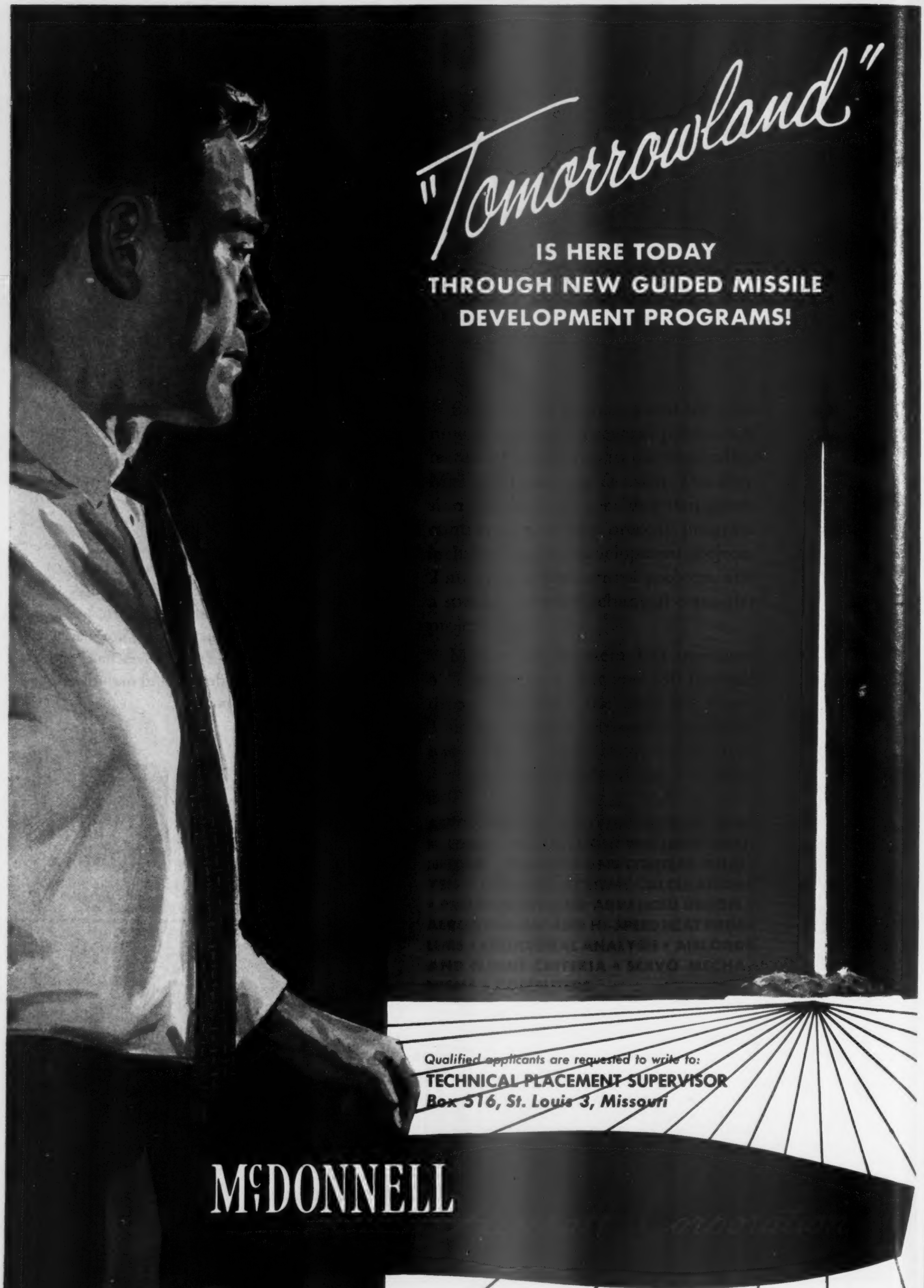
Bahn, Gilbert S., Sr. Thermodynamics Engr.
Clara, Ernest A., Engr.
Drake, John A., Director
French, Edward P., Sr. Thermodynamics Engr.
Long, David E., Aerodynamics Engr.
Lowry, Robert K., Devel. Engr.
Kux, Frank W., Engineering Specialist
Marquardt, Roy E., President
Morris, Brooks T., Executive Engr.
Reynolds, J. Louis, Director of Customer Relations Div.
Smallberg, Merle, Project Engr.
Walter, Don L., Vice President, Engng.
Wead, Robert K., Chief Application Engr.
Wilson, Robert D.
Winter, John S., Chief Engr.
Unterberg, Walter, Sr. Thermodynamics Engr.

MARQUETTE TERRACE, INC. PLAINVIEW, L. I., N. Y.

Gerla, Morton, Vice President

GLENN L. MARTIN COMPANY, BALTIMORE, MD.

Arbuckle, Philip H., Assist. Project Engr.
Beale, Robert J., Rocket Propulsion Engr.
Berger, Otto, Sr. Electro-Mech. Engr.
Black, Frank R., Engr.
Burner, Lincoln C., Electronics Engng. Assist.
Burridge, James L., Structures Supvr.
Caldwell, Donald C., Associate Engr.
Cosner, Donald L., Sr. Engr.
Crum, Earl M., Jr., Engr.
DeNike, John, Assist. Project Engr.
Divine, Laurence A., Field Service Engr.
Dubin, Jack, Group Engr.
Eckenroth, Howard F., Electro-Mech. Engr.
Felt, N. Elliott, Jr., Operations Mgr.
Florman, Irving S., Propulsion Engr.
Haefeli, Rudolph C., Sr. Engr.
Heckenmueller, Edward G., Assoc. Engr.
Jensen, Jorgen, Group Engr.
Kammeyer, Roger A., Assoc. Engr.
King, Douglas A., Sr. Aerodynamics Engr.


"Tomorrowland"
IS HERE TODAY
THROUGH NEW GUIDED MISSILE
DEVELOPMENT PROGRAMS!
Qualified applicants are requested to write to:
TECHNICAL PLACEMENT SUPERVISOR
Box 516, St. Louis 3, Missouri
McDONNELL

Kipin, George, Sr. Engr., Structures
Kotowski, John A., Sr. Engr.
Landy, Nelson E., Group Engr.
Miller, Gerald N., Assoc. Engr.
Morrison, Herbert E., Electronics Standards Engr.
Munnell, Edward T., Project Engr.
O'Connor, William A., Jr., Sr. Publications Engr.
Robertson, Donald K., Design Engr.
Robinson, Willard C., Sr. Engr.
Schuett, Egon H., Assoc. Engr.
Stoiko, Michael, Sr. Rocket Prop. Engr.
Sullivan, Leslie J., Powerplant Engr.
Tuhy, Ivan E., Design Specialist, Solid Propellants & Explosives
Uhl, Edward G., Vice President
Waters, William L., Fld. Serv. Rep.
Williams, Sears, Assist. Proj. Engr.
Wolf, John William, Sr. Armament Engr.
Zahn, Herman S., Jr. Sr. Engr.

Denver, Colo.
Barnocky, Joseph S., Electronic Engr.
Cole, Dandridge M., Design Specialist
Harvey, Harold J., Sr. Structural Engr.
Koshar, Martin M., Assoc. Engr.
Lea, Richard C., Group Engr. II
Ring, Elliot, Group Engr.
Ruckert, William Carl, Customer Relations Mgr.
Purdy, William G., Proj. Engr.
Van Pelt, John M., Aerodynamicist
Youngquist, John R., Chief Engr.

MATER ENGINEERING CO., CORVALLIS, ORE.
Mater, Milton H., Managing-Partner

W. L. MAXSON CORPORATION, NEW YORK, N. Y.
Bjorkman, John W., Sales Mgr.
Csillag, Louis M., Sr. A Draftsman
Leander, Hugo A., President
Slaughter, Willis R., Vice President
Skeist, S. Merrill, Vice President
Spitalny, Max S., Technical Writer
Spray, Ellis L., Executive Vice President
Strickholm, George E., Equipment Engr., Electronics Div.
Vaughan, John A., Vice President

Old Forge, Pa.
Holt, Oscar E., Assist. Plant Mgr.

MAXSON INSTRUMENTS, LONG ISLAND CITY, N. Y.
Tuomey, John, Supervisor Prod. Des.

McCOLLUM & MALE, INC., LAKEWOOD, OHIO
Male, Theodore

McCORMICK-SELPH ASSOC., HOLLISTER, CALIF.
La Haye, Frank W., Vice President
McCormick, Donald A., President
Rudneff, Ylya A., Engng. Dwg. Checker

McDONNELL AIRCRAFT CORP., ST. LOUIS, MO.
Bodicky, Andrew L., Devel. Engr.
Brumberg, Ben G., Chief Engr.
Brown, Russell E., Sr. Rep.
Dors, Joseph C., Devel. Engr.
Godfrey, P. Whitson, Proj. Group Engr.
Kilcher, Stanley M., Aerodynamicist
Mayes, James T., Jr., Group Engr.
Mazzoni, James J., Sr. Design Engr.
McDonnell, Sanford N., Group Engr.
Nance, Julian
Ostroff, Harold H., Chief Propulsion Engr
Perkins, Kendall, Vice President-Engng.
Schroeder, Richard L., Jr. Design Engr.
Turner, Burr V., Engng. Officer
Yee, Dickman, Design Engr.

MECCA CABLE & SERVICE CO., HOUSTON, TEXAS
Nost, M. Chapman, Chief Engr.

MELPAR, INC., FALLS CHURCH, VA.
Lafevre, Leland M., Electro Mech. Engr.
Lee, Robert J., Electrical Engr.

MENASCO MFG., CO., BURBANK, CALIF.
Gerry, Julian E., Assist. Gen. Sales Mgr.

METAL HYDRIDES, INC., BEVERLY, MASS.
Banus, M. Douglas, Director Res. and Devel. Labs.

METAL & THERMIT CORPORATION, EAST CHICAGO, IND.
Parker, Gilbert R., Chief Chemist

New York, N. Y.
Schroeder, Carl R., Mgr. Metal Sales

MIDWESTERN INSTRUMENTS, TULSA, OKLA.
Holloway, Dan M., Sales Engr.

MILLER PRODUCTS, INC. NO. CHICAGO, ILL.
Casanov, L. C., President

MILLER RESEARCH LABS., BALTIMORE, MD.
Fradin, Samuel, Project Mgr.

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY PHILADELPHIA, PA.
DeBacker, Theodore A., Reactor Control Engr.

Minneapolis, Minn.
Diels, Melvin F., Sr. Research Engr.
Gaertner, Reinhold V., Design Engr.
Poston, Ernest, Design & Devel. Engr.

West Los Angeles, Calif.
Deden, John T., Sr. Engr., Production Des.

MINNESOTA MINING & MFG. CO., IRVINGTON, N. J.
Krummel, Frederick C., Chief Project Engr.
Modig, Gerald R., Chemist, Product Devel.

MISSILE RESEARCH MFG. CORP., VAN NUYS, CALIF.
Patrichi, Mihai D., Chief Engr.

MODIGLIANI GLASS FIBERS, INC., LANCASTER, OHIO
Modigliani, Piero, Pres. & Tech. Dir.

MONROE HARDWARE CO., MONROE, N. C.
Dillon, Thomas P., Assist. Mgr., Retail Dept.

MONSANTO CHEMICAL CO., EVERETT, MASS.
Swisher, Robert D., Research Group Leader

MORGAN ENTERPRISES, ELMHURST, LONG ISLAND
Kent, Marc Theodore, Jr., Consultant

MOTOROLA, INCORPORATED CHICAGO, ILL.
Suloway, N. S., Mechanical Engr.

Riverside, Calif.
Hayes, John W., Mechanical Engr.

NATIONAL DESIGN AND RESEARCH CORP., ANN ARBOR, MICH.
Klemach, Fred A., President
Rupert, Samuel J., Vice President., Mfgng.

NATIONAL ELECTRONICS, INC., GENEVA, ILL.
Wetter, Charles R., Engr.

NATIONAL NORTHERN, WEST HANOVER, MASS.
Saffer, Charles M., Jr., Assist. Mgr.

NATIONAL RESEARCH CORP., CAMBRIDGE, MASS.
Greene, Frederick H., Jr., Admin., Nuclear Energy Dept.

NATIONAL RESEARCH & DEVEL. CORP., ATLANTA, GA.
Adams, Carsbie C., President

NATIONAL ROCKET CORP., HUNTINGTON PARK, CALIF.
Edler, Henry G., President & Gen. Mgr.

NATIONAL SCIENTIFIC LABS. INC., WASHINGTON, D. C.
Benditzky, Edgar, Sr. Field Engr.

NATIONAL WATER LIFT COMPANY, KALAMAZOO, MICH.
Willis, Clifford E., Vice Pres. & Gen. Mgr

NEELY ENTERPRISES, LOS ANGELES, CALIF.
Davis, John F., Field Engr.

Las Cruces, N. M.
Davis, Earl C., Field Engr.

NEHI PRODUCTS, FRESNO, CALIF.
Holcomb, Sanford P., Assist. Mgr.

THE NEW YORK AIR BRAKE CO., NEW YORK, N. Y.
Laird, A. Wilson, Vice President
Nierenberg, Byron, Assist. to Vice Pres.

Watertown, N. Y.
Friant, David R., Engr.
Marvin, Richard H., Chief Engr., Hydraulic Equipment

NEW YORK AIRWAYS, NEW YORK, N. Y.
Brock, Horace, Exec. Vice President

N. Y. CENTRAL R. R., NEW YORK, N. Y.
Schild, Lyndel B.

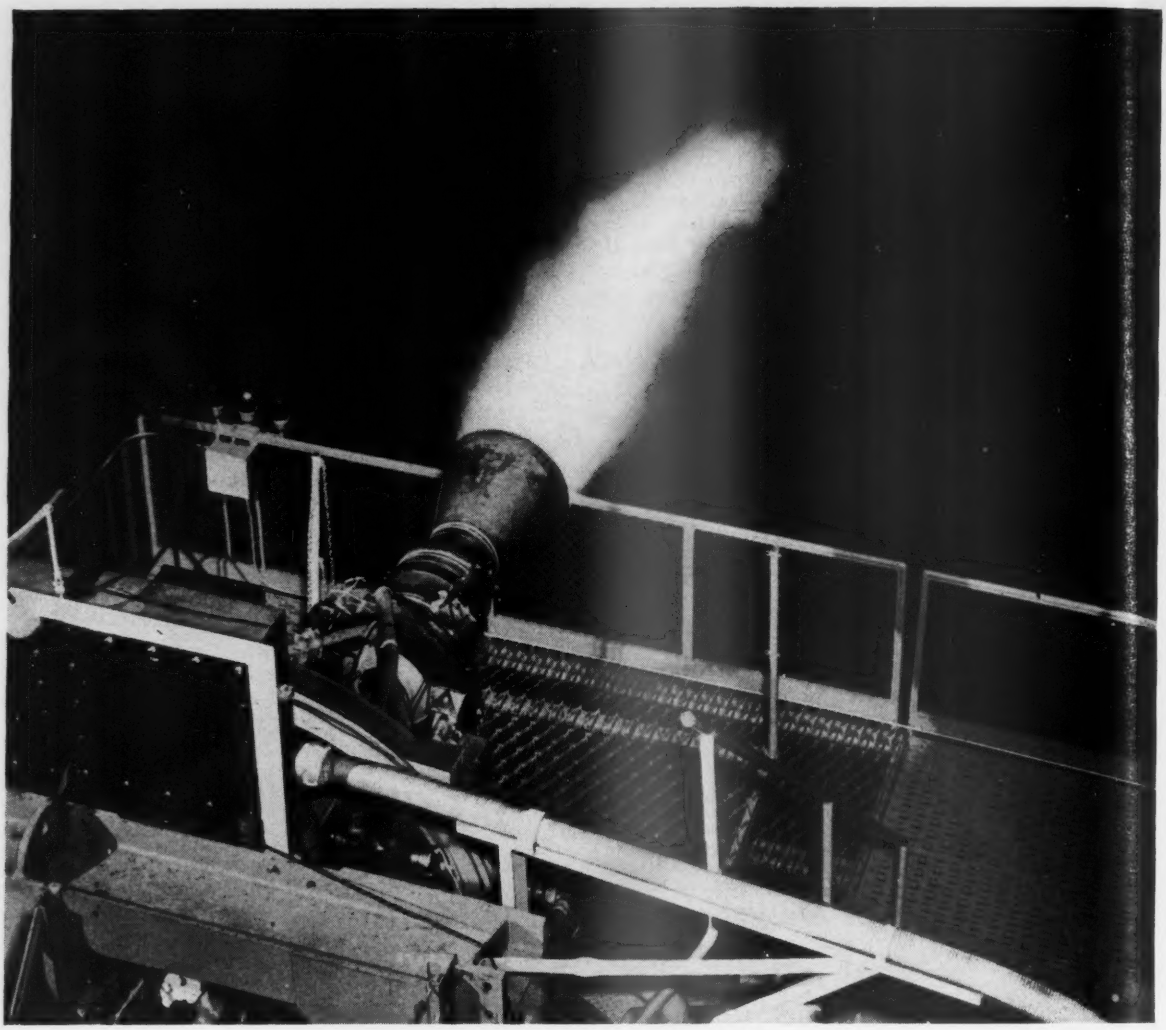
NEW YORK TELEPHONE CO., NEW YORK, N. Y.
Giles, Cedric

NORDEN KETAY CORP., NEW YORK, N. Y.
Butler, George D., Director of Sales
Levine, R., Dir. of Design & Appl. Engng.
Porter, R. W., Chief Engr.

Milford, Conn.
Brown, Edward M., Sales Engr.
Seymour, R., Chief Engr.

White Plains, N. Y.
Schaeffer, C. F., Tech. Director

NORTH AMERICAN AVIATION, INC., LOS ANGELES, CALIF.
Antoniades, Arthur J., Research Engr.
Bacquie, Guy O., Research Mechanic
Blair, Edward A., Leadman, Publications Group
Boyd, Edgar W., Service Engr.
Cox, John, Engr.
Douglas, David G., Research Engr.
Emery, Ernest M., Devel. Engr.
Fore, Wallace E., Assist. Plant Engr.
Frederickson, Henry A., Sr. Research Engr.
Hamlin, Chauncey J., Jr., Project Engr.
Hege, Douglas W., Project Engr.
Henley, Robert R., Supvr., Industrial Engng.
Hovland, Henry H., Eng. Rep.
Jennings, Frederick A., Research Engr.
Kunz, Kenneth E., Design Engr.
Lewis, Donald W., Research Engr.
Marsh, H. W., Sr. Design Engr.
Mehegan, Paul F., Research Engr.
Orr, Elsie C., Research Engr.
Petersen, Benjamin G., Supvr.-Aerodynamics Project



Night firing tests on early ROCKETDYNE engines helped speed the development of today's models whose power cannot be disclosed.

Presing, Joseph A., Jr., Sr. Design Engr.
Riedel, Elmer H., Jr. Research Engr.
Rosenthal, Walter L., Research Engr.
Sutor, Alois, Sr. Research Engr.
Warren, Stuart A., Research Engr.
Zehetner, Howard, Propulsion Res. Analyst

Autonetics Division
Leisz, George W., Instrumentation Supvr.
Schmied, William F., Jr., Staff Engr.

Columbus, O.
Beans, E. William, Engr.
Bell, Marion Wetherbee Jack, Engr. Design
DeLany, Jere T., Eng. Thermodynamicist
Guthrie, Charles Rex, Research Engr.
Horr, Raymond W., Senior Engr., Research
Johnsen, Kenneth, Design Engr.
Kelley, Edward H., Group Engr.
Kennedy, Edward R., Project Thermodynamicist
Lays, Edward J., Sr. Aerodynamics Engr.
Mandell, Donald S., Aerodynamicist
Martin, Mack L., Flight Test Engr.
McClintock, Robert, Engr. Structures
Naab, Kenneth N., Aerodynamicist
Pavlosky, James E., Engr.
Smith, Kirsey O., Aero. Engr., Aerodynamics Engng. Dept.
Wegner, Earl T., Assist. Flight Test Project Engr.
Welch, William W., Sr. Engr.

Downey, Calif.
Beerer, Joseph G., Gen. Mgr.
Boden, Robert H.
Brown, Jack W.
Burns, Francis S., Flight Test Engr.
Cannon, John N., Engr.
Carpenter, Dale, Research Engr.
Cole, Thomas E., Research Engr.
Cooper, Homer V., Jr., Group Leader, Flight Test
DeSavino, Wm. A., Research Engr.
Donaldson, Charles W., Design Engr.
Dooley, Donald A., Sr. Research Engr.
Ficklen, Joseph B., III, Consultant
Galambos, Joseph A., Research Engr.
Gillespie, Rollin W., Engr.
Hitchens, A. L.
Hoffman, Willard A., Sr. Engr., Missile Flight Test
Horner, John W., Preliminary Design, Rocket Coordinator
Hutmacher, Eugene S., Supvr., Equipment Engng.
Lanford, Wayne S., Tech. Illustrator, Sr.
Myers, Thomas E., Assist. Propulsion Test Mgr.
Owens, Richard H., Experimental Res. Engr.
Riddlesbarger, Roger J., Supervisor
Rogers, Robert W., Mech. Engr.
Rudolph, Gonzales
Spoehel, Edwin H., Design Engr.
Swanson, Lyle M., Research Engr.
Tormey, John F., Group Leader
Whinery, Robert O., Structures Engr.
Widawsky, Arthur, Engr. Aerodynamics

New York, N. Y.
Benedict, George W., Mgr.

Patrick AFB, Fla.
Clements, James S., Research Engr.
Tallman, Harold L., Jr., Research Engr.

Rocketdyne
Agulia, Richard S., Supvr., Performance Analysis
Albanese, Philip, Supvr., Prelim. Design
Ashmead, Richard R., Group Leader, Turbomachinery
Baisley, W. J., Supervisor
Baker, Dwight, Sr. Research Engr.
Barrett, Ernest M., Research Engr.
Bayne, Walter M., Supervisor
Bellamy, Charles W., Sr. Research Engr.
Benham, Theodore F., Research Engr.
Benson, James A., Service Engr.
Bockstahler, Alan J., Research Engr.
Bond, William E. G., Exper. Devel. Engr.
Bowers, William M., Research Engr.
Boynton, William W.
Brennan, William J., Chief, Design and Devel. Section
Broadston, James A., Mgr., Prop. Field Lab.
Brooks, William S., Sr. Research Engr.
Brown, Cecil D., Research Engr.
Brown, Frank H., Jr., Research Engr.
Bruschi, Arthur T., Research Engr.
Buccella, Franklin J., Research Engr.
Bullard, Charles Phil
Byron, Robert A., Engr. Research, Experimental Div.
Calamore, Donald V., Research Engr.
Cancilla, Myron A., Research Engr.
Carter, Edward H., Supvr., Engng.
Cartotto, Edward, Group Leader, Instrumentation & Equipment
Castenholz, Paul D., Assist. Group Leader, Combustion Devices
Cecka, William J., Jr. Chief, Engng. Test Section
Chase, John W., Jr. Field Engr.
Cohen, Milton, Research Engr.
Colahan, Wayne J., Research Engr.
Converse, John W., Test Engr.
Conyers, John R., Supvr. Prelim. Design
Costello, John R., Research Analyst
Coubrough, Robert J., Research Engr.
Cramer, Frank B., Research Engr.
Crossland, Winford D., Group Leader
Cumming, James M., Project Engr.
Dixon, Thomas F., Chief Engr.
Eilenberg, Stanton L., Research Engr.
Erbs, Joseph E., Research Engr.,
Ezell, William F., Res. Engng. Specialist
Finger, John C., Research Engr.
Fons, Phillip Corrigan, Instrumentation Design Specialist
Forslund, Gerald M., Jr., Research Engr.
Fuller, Paul N., Research Engr.
Gaffney, Frank J., Research Engr.
Georgius, Henry K., Sr. Research Engr.
Gillean, James I., Jr. Research Engr.
Goe, Ronald, Research Engr.
Goldman, Jack R., Field Service Rep.
Gould, Roger K., Research Engr.
Greenfield, Stanley P., Supvr., Research
Haag, Gordon E., Research Specialist
Hahn, Jack R., (Supr.) Large Thrust Chamber Ass'ys.
Hast, Drea R., Research Engr.
Hatfield, C. D., Field Rep.
Healy, Roy, Sr. Research Engr.
Hewitt, George F., Research Engr.
Hoffman, Samuel K., Gen. Mgr.
Hogan, Orien L., Engng. Rep., Rocket Eng.
Hume, James P., Sr. Research Engr.
Huzel, Dieter K., Supervisor
Ingham, Kenneth T., Supvr., Turbo Machinery Design
Jackson, Elbert G., Research Engr.
Johnson, N. Dale, Sr. Research Engr.
Johnson, Wayne R., Engng. Supvr., E4FB
Johnston, Robert E., Research Engr.
Jones, Paul R., Research Engr.
Jones, Walter H., Sr. Research Engr.
Jopson, Hubert S., Supvr., Servo Unit Controls Group
Kallis, Felix, Sr. Research Engr.
Kanner, Gideon, Research Engr.
Karen, Bernard, Research Engr.
Karpenko, Vadim A., Engng. Research
Kaye, Kenneth S., Research Engr.
Keeler, Raymond A., Supervisor Area #2 Large Engines
Kelly, Arnold J., Research Engr.
Knittle, Walter A., Research Engr.
Kraemer, Robert S., Supvr., Preliminary Design, Engng. Dept.
Lang, James R., Research Engr.
Lamont, Ernest A., Design Engr.
Larson, Vernon R., Research Engr.
Lawson, Loretta F.
Leitch, Donald M., Supervisor, Armament Rockets Design and Devel.
Levine, Robert S., Assist. Group Leader
Lieberman, David, Sr. Resarch Engr.
Lieberman, Seymour, Research Engr.
Linse, Robert E., Supervisor
Liu, Dr. Frederick F., Sr. Research Scientist and Research Engng. Specialist
Marsden, Norman H.
Mascolo, Richard W., Research Engr.
McWilliams, Carlton L., Supvr., Experimental Analysis Unit
Miller, Lowell M., Sr. Research Engr.
Monteath, Edward B., Assist. Proj. Engr.
Moore, Robert L., Supervisor
Morin, R. R., Project Engr.
Mower, William W., Group Leaders, Combustion Devices Group
Mowers, Bob, Research Engr.
Mueller, Kurt H., Sr. Research Engr.
Musial, W. P., Service Analyst, Field Serv.
Mussell, Donald E., Research Engr.
Neuburn, Floyd A., Research Engr.
Nicolay, Phillip E., Sr. Test Engr.
Nolan, Beaman B., Sr. Research Engr.
Olsen, Milo R., Test Engr.
Orr, Jerry A., Research Engr.
Ortlieb, Richard, Designer
Patterson, Joseph V., Jr. Engr.
Peppler, John R., Sr. Research Engr.
Peters, Alphonse P., Research Engr.
Pfouts, J. O., Sr. Research Engr.
Ragsac, Robert V., Research Engr.
Reid, William L., Research Engr.
Reuel, Norman C., Assist. Section Chief
Richardson, John E., Jr. Research Engr.
Robinson, Kendal S., General Supvr.
Rodriguez, Charles J., Sr. Research Engr.
Rosenblum, Martin H., Research Engr.
Rosenfeld, Herman H., Electrical Engr.
Rothman, David, Research Engr.
Sensenbaugh, Norman D., Research Engr.
Schurman, Kurt J.
Searle, Richard F., Research Engr.
Sellers, John P., Jr., Sr. Engr.
Sliwinski, Mitchell S., Sr. Research Engr.
Sitton, Louis J., Research Engr.
Sopp, George A., Research Engr.
Soteriou, James G., Sr. Designing Engr.
Stassinos, James W., Reseach Engr., Devel.
Stephens, Henry C., Sr. Design Engr.
Studhalter, Walter R., Project Engr.
Sutton, George P., Group Leader, Preliminay Design
Tietjen, Howard F., Research Engr.
Thompson, Floyd J., Research Engr.
Thompson, Robert J., Jr., Supvr. of Prop. Chemistry
Traylor, John E., Research Engr.
Turner, Kenneth A., Research Engr.
Verba, Michael Jr., Research Engr.
Vogt, Paul R., Group Leader
Vorwerk, Vern R., Design Engr.
Warren, Victor M., Test Engr.
Webber, William T., Research Engr.
Weber, Lawrence D., Sr. Research Engr.
Wesels, Lewis J., Group Engr.
Wightman, Robert R., Engr.
Wilford, David B., Research Engr.
Willinski, Martin I., Research Engr.
Yaplee, Allen S., Research Engr.
Yee, Theodore S. H., Research Engr.
Young, Richard H., Research Engr.
Zabel, Patrick H., Test Engr.
Zimmerman, Jack M., Research Engr.

Santa Susana, Calif.
Araki, Minoru Sam, Research Engr.
Davey, George R., Research Engr.
Domokos, Steve J., Research Engr.
Gurskis, Joseph Jr., Research Engr.
Henry, Stacey C., Prop. Res. Mechanic
Kelley, John F., Project Engr.
Myers, Joseph A., Sr. Propulsion Mech.
Sanchin, Dominick J.
Urbanovsky, Ernest J., Research

NORTHROP AIRCRAFT, INC., HAWTHORNE, CALIF.
Beller, Gordon M., Group Engr.
Elwell, Harwood C., Test Engr.
Holmes, William C., Jr., Chief, Power Plant Eng. Dept.
Munsey, Edward H., Supvr., Missile Test Facility

Myers, Samuel A., Research Analyst
Paiss, Hal, Service Engr.
Reimer, Ray, Missile Body Group Engr.
Ripley, Herbert S., Prop. Group Engr.
Rohrer, William G., Field Rep.

Patrick AFB, Fla.
Girard, John, Technician
Lewis, Richard B., Supvr., Missile Test Engng.
Smith, Verl O., Chief, Missile Test Facility
Vreeland, Maxine Grammer, E.C.O. 'A'

**NORTON COMPANY,
WORCESTER, MASS.**
Westerholm, Ronald J., Sales Engr.
Wheildon, William M., Research Engr.
Crompton, George Jr., Patent Attorney

**CHARLES G. NOSKA COMPANY,
PHILADELPHIA, PA.**
Noska, Charles G., President

**G. O. NOVILLE & ASSOCIATES,
LOS ANGELES, CALIF.**
Hardy, Maurice M., Design Engr.

Santa Monica, Calif.
Aaron, Robert H., Vice Pres., Engng.

**NUCLEAR DEVELOPMENT CORP. OF AMERICA,
WHITE PLAINS, N. Y.**
Gruber, Alan R., Division Director

**ODIN ASSOCIATES,
PASADENA, CALIF.**
Michelson, Irving, President

**OERLIKON TOOL & ARMS CORP. OF AMERICA,
ASHEVILLE, NORTH CAROLINA**
Brandenburger, Ernst Max, Production Mgr.

**OFFSHORE RAYDIST, INC.
NEW ORLEANS, LA.**
Suggs, Robert L., President

**OLIN-MATHIESON CHEMICAL CORPORATION
NEW YORK, N. Y.**
Childs, Herbert C., Product Mgr.
McLain, Joseph H., Consultant

Baltimore, Md.
Theobald, O. J., Jr., Mgr. Nitrogen Prod.
Vincent, George P., Director of Govt. Serv.

East Alton, Ill.
Blake, T. Gaynor, Research & Devel. Mgr.
Cooley, Robert A., Assist. to Research Dept. Mgr.
Drexelius, Victor W., Industrial Cartridge Devel. Supervisor
O'Neill, John J., Jr., Assist. to V. P. and Gen. Mgr.
Rippe, Robert S., Mgr., Technical Relations

New Haven, Conn.
D'Amato, Dominic A., Project Engr.

Niagara Falls, N. Y.
Bramann, George M., Contracts Admin.
Clark, Charles C., Mgr. Univ. Research
Griffin, Donald N., Assoc. Director, Liquid Propellant Application Research.
Herndon, L. Kermit, Tech. Director
Thomas, Delbert D., Project Engr.

Pasadena, Calif.
Cunningham, George M., District Sales Mgr.

Washington, D. C.
Sosnoski, Harry A., Director of Operations, Aviation Division

**THE OKONITE CO.,
PATERSON, N. J.**
Bottari, Arnold, Process Engr.

**PAUL OMOHUNDRO CO.,
PARAMOUNT, CALIF.**
Omohundro, Paul, President

**ORENDA ENGINES LIMITED,
TORONTO, ONTARIO, CANADA**
Anderson, George E., Chief Tech.
Grinyer, Charles A., Vice President, Engng.
Morrison, Donald E., Chief Combustion Engr.
Scott, James H., Supvr. Eng. Test Equip.
Thue, Kenneth S., Head Aerodynamics Engr.
Young, Kenneth B., Chief Materials Engr.

**OXO EQUIPMENT CO.,
NEW LENOX, ILL.**
Matasovic, John L., President

**PACIFIC TELEPHONE & TELEGRAPH CO.,
SEATTLE, WASH.**
Okerlund, Robert T., Central Office Equipment Maintenance
Rice, Tom R.

**PAGE COMMUNICATIONS ENGINEERS, INC.,
WASHINGTON, D. C.**
Bailey, D. K., Scientific Director
Page, Esterly C., President
Page, Virginia Erwin, Engr.

**PAN-AMERICAN WORLD AIRWAYS, INC.,
NEW YORK, N. Y.**
Gledhill, Franklin, Vice President
Pryor, Samuel F., Vice President and Assist. to President
Richards, Muriel M.
Trippe, Juan T., President

Patrick Air Force Base, Fla.
Blodgett, Charles L., Supvr., Liquid Oxygen Facility
Ellis, Charles L., Deputy Division Mgr. Tech.
Felzenberg, Albert, Electronic Engr.
Jacobson, Howard F., Deputy Division Mgr. Logistic Oper.
Mitchell, Richard S., Vice President
Mitchell, William P., Supt. Range Services
Penny, Harry R., Electronics Technician
Scattergood, William L., Electronic Tech.
Taylor, James R., Mgr.
Werry, Frederick Charles, Jr., Mgr.
Wright, Howard R., Jr., Performance Analysis Engr.
Yordy, Richard L., Base Mgr., Cape Canaveral Aux. AFB

**PARKER AIRCRAFT,
LONG BEACH, CALIF.**
Moebius, Charles M., Staff Engr.
McGinty, Walter F., Sales Engr.

**PASTUSHIN AVIATION CORP.,
LOS ANGELES, CALIF.**
Jacobson, Oliver H., Thermodynamicist

**PEABODY ENGINEERING CORPORATION,
NEW YORK, N. Y.**
Vroom, Robert C., Vice President

**PEERLESS INSTRUMENT CO.,
ELMHURST, N. Y.**
Ellenberg, Karl H.

**PENBERTHY INJECTOR CO.,
DETROIT, MICH.**
Johnson, H. James, Research Engr.

**PENDRAY, COOK & HOVING,
NEW YORK, N. Y.**
Pendray, G. Edward, Public Relations Counsel

**PENNSYLVANIA SALT MFG. CO.,
PHILADELPHIA, PA.**
Gall, John F., Director, Inorganic Research Dept.
Karr, Errol H., Mgr., Tech. Div.

**PERFECT CIRCLE CORP.,
FT. WAYNE, IND.**
Marie, Robert, Electronics Proj. Engr.

**PERFEX CORPORATION,
MILWAUKEE, WIS.**
Neudeck, Gene T., Assist Sales Mgr.

**PETROLEUM PROCESSING,
NEW YORK, N. Y.**
Davidson, Robert L., Assoc. Editor

**PHELPS DODGE,
FT. WAYNE, IND.**
Fogel, Jerry, Jr. Designer

**PHILADELPHIA METAL STAMPING CO.,
PHILADELPHIA, PA.**
Caraivan, Jordan

**PHILCO CORP.,
PHILADELPHIA PA.**
Daoussis, Spyros, Project Engr.
Gillies, Joseph H., V. P., Gen. Mgr. Govt. & Industrial Div.
Lagore, Joseph A., Vice President-Mfgng.
McLean, James D., Vice President, Govt. & Industrial Div.
Peltier, Frank D., Director of Mech. Engng.
Smith, Alden W., Sales Engr.
Spielman, Sterling C., Dir. Electronic Eng., Govt. & Industrial Div.
Sumerlin, William T., Section Engr.
Tucker, James D., Jr., Advisor for Training
White, Z. Lewis, Project Engr.
Williams, Marshall A., General Sales Mgr.

Cape Canaveral, Fla.
Roble, Arthur R., Field Engr.

Chicago, Ill.
Myers, Willard D., Regional Sales Engr.

Los Angeles, Calif.
McKey, Dixie B., Regional Mgr.

Washington, D. C.
Stephey, Harry M., Govt. Sales Mgr.

**PHILLIPS PETROLEUM COMPANY,
BARTLESVILLE, OKLA.**

Idaho Falls, Idaho
Kimball, Robert B., Assoc. Chemist

McGregor, Texas
Boyer, Lee H., Ballistic Evaluation & Data Reduction Supervisor
Crask, James A., Project Engr.
Gose, Robert Oren, Western Tech. Rep.
Files, F. M., Mgr., Manufacturing Branch
Fiock, Ernest F., Director, Tech. Devel. Br.
Haymes, William G., Design Engr.
Harty, Charles H. III, Chemist
Kyser, Gerald M., Mathematician
Lang, E. Z., Technical Assist.
Maciula, L. A., Assist. Mgr., Rocket Fuels Division
Malick, Emil A., Mgr.
McBride, John A., Mgr. Development Br.
Miles, George E., Rocket Design Engr.
Rush, E. E., Mech. Engr.
Sauls, John F., Mgr. Employee Relations Branch
Scharf, Reinhard W., Chemical Engr., Rocket Fuels Div.
Terry, R. C., Mgr., Office Services

**PHOENIX IRON & STEEL COMPANY,
PHOENIXVILLE, PA.**
Coutant, Jay G., Secretary & Assist. Treas.

**PIAGGIO & CO.,
GENOVA, ITALY**
Casiraghi, Giovanni P., Chief Engr.

**PIASECKI HELICOPTER CORP.,
MORTON, PA.**
Horne, Harry B., Jr., Assist. to Vice Pres.

**PIROTECNIA LECEA, S. A.,
VITORIA, SPAIN**
de Lecea, Alberto M., Mgr. Director, Engr.

**PLANET PRODUCTS CORP.,
CINCINNATI, OHIO**
Rosenberg, Han K., Mech. Engr., Prod. Mgr.

PLANNING RESEARCH CORP., LOS ANGELES, CALIF.
Gendler, Stanley L., Project Engr.
Krieger, Stuart A., Vice Pres.

PORT OF NEW YORK AUTHORITY, NEW YORK, N. Y.
Borland, William C., Coordinator of Engng.
Klueg, Jerome, Designer
Nilsson, Frederick W., Airport Designer

POWER GENERATORS, INC., ALBANY, N. Y.
Munch, Neil E., Chief Project Engr.

PRECISION EQUIPMENT CO., INC., TORRANCE, CALIF.
Gilman, Richard, President

PRENCO PROGRESS AND ENGINEERING CORP., LTD. TORONTO, ONTARIO, CANADA
Chmel, J. K., Pres. and Managing Director

PROFESSIONAL CONSULTANTS, PASADENA, CALIF.
Newton, Johannes S., President
Vance, Edward M., Vice President., Engng.

PROM MAGAZINE, ST. LOUIS, MO.
Miller, Julian H. II, Publisher

PROPULSION RESEARCH CORP., SANTA MONICA, CALIF.
MacLeod, Gordon J., Aerodynamics Engr.
Hozaki, Shigemi, Aerodynamicist
Kumm, Emerson L., Sr. Engr.
Stoner, Willis A., Aerodynamicist

QUANTUM, INC., CHESHIRE, CONN.
Jewett, Warren R., Staff Scientist

RADIO CORP. OF AMERICA, CAMDEN, N. J.
Merrill, Harvey B., Jr., Sales Mgr.

Moorestown, N. J.
Kaden, George, Mech. Project Engr. "A"
Walker, Marvin J., Design Engr.

Patrick AFB, Fla.
Conrad, Anthony L., Mgr., Missile Test Project
Everhard, Fredric U., Jr., Electronics Engr.
Graeber, Ralph P., Mech. Engr.
Hayne, Walter R., Electronics Tech.
Herbert, John T., Jr., Electronic Engr.
McLaren, Kenneth M., Mgr., Planning & Analysis Section
Pace, Thomas C., Engr.
Paz, Ralph B., Contract Administrator
Peghiny, Ernst Lee, Circuit Project Engr.
Raulins, Kenneth R., Mgr.
Roberts, William L., Mid-West Rep.
Rogers, Loren E., Electronic Engr.
Vreeland, Arthur, Mgr.
Wright, John R., Project Engr., AFMTC Firing System

RADIOPLANE CO., VAN NUYS, CALIF.
Burton, Edward B., Supvr., Armament Des.
Cartabiano, A., Chief of Flight Test
Mayer, Frank S., Jr., Structures Sec. Supvr.
Nelson, Willard, Research Tech.
Powell, Robert R., Missile Test Engr.
Rice, Charles E., Instrumentation Engr.

Holloman AFB, N. M.
Fortuna, Anthony F., Assist. Quality Control Mgr.

RAHM INSTRUMENTS, INC., NEW YORK, N. Y.
Senseney, George Towner, Vice Pres.-Engng.
White, Roy, Secy.-Treas.

RAMO-WOOLDRIDGE CORP., LOS ANGELES, CALIF.
Abramson, Bertram N., Tech. Staff
Adelman, Barnet R., Head, Solid Eng. Dept.
Anderson, Philip N., Structures Des. Engr.
Attias, John J., Member, Tech. Staff, Prop. Dept.
Baxter, Albert N., Jr., Project Engr.
Brewer, G. Daniel, Tech. Staff
Clauson, Milton U., Director
Cornog, Robert A., Tech. Staff
Crum, John O., Tech. Staff
Donovan, Allen, Director, Aero. and Devel. Staff
Dunn, Louis G., Vice Pres. and Director, Guided Missile
Finney, Albert T., Tech. Staff
Fletcher, James C., Director, Electronics R. and D.
Gaylord, Robert S., Member of Tech. Staff
Ives, George M., Member Tech. Staff
Johnson, James H., GMRD Division
Koen, Frank L., Jr., Physicist
Koether, Fred A., Head, Tech. Information Services
Lawrence, Herbert R., Assoc. Director, Propulsion & Structures
Lehan, Frank W., Asoc. Director, Electronics Res. & Devel. Staff
McDowell, Donald R., Publications Mgr.
Mettler, Ruben F., Director
Piech, John S., Technical Staff.
Ramo, Simon, Executive Vice President
Scesa, Steve, Tech. Staff Member
Seifert, Howard S., Chief, Prop. Analysis
Sibbitt, Wilmer L., Member Tech. Staff
Thiel, Adolf K., Sr. Staff Engr.
Toporeck, Edward R., Director, Systems Test Staff
Vogel, Jack Morris, Member Tech. Staff

Patrick AFB, Fla.
Rypinski, Robert B., Regional Mgr.

THE RAND CORP., SANTA MONICA, CALIF.
Clement, George H., Acting Chief
Goldsmith, Martin, Assoc. Engr.
Heffern, Eldred Charles, Assoc. Engr.

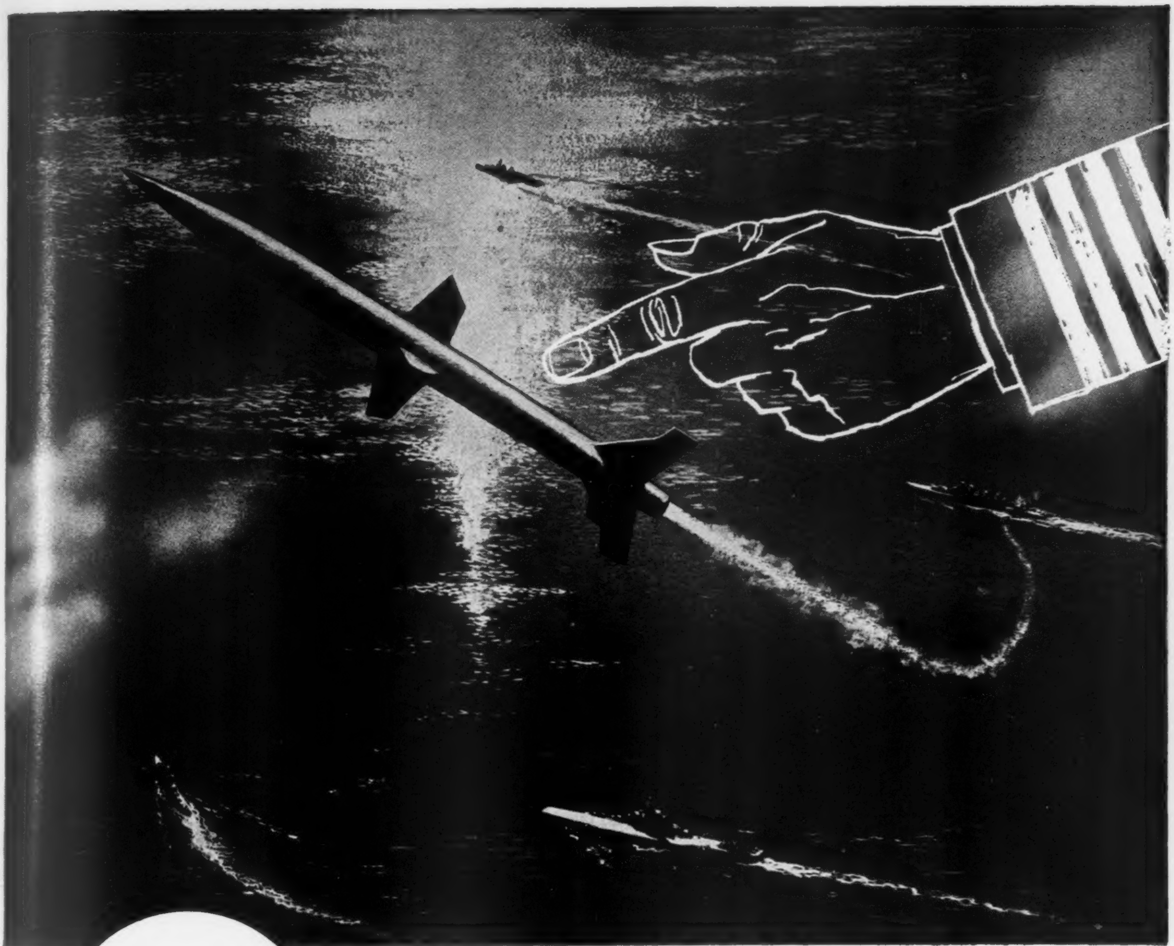
RAPID FINANCE & LOAN, BALTIMORE, MD.
Cascio, Salvatore J., Jr., Credit Mgr.

RAYMOND ENG. LAB., INC., MIDDLETOWN, CONN.
Dowjat, Richard E., Engr.

RAYTHEON MFG. CO., WALTHAM, MASS.
Robba, William A., Head, Nuclear Power Group
Vogt, Alex G., Mechanical Engr.
Szecsody, Alex J., Mechanical Engr.

Bedford, Mass.
Green, Bigelow, Technical Writer

REACTION MOTORS, INC., DENVILLE, N. J.
Ayers, Milton E., Public Relations
Bendersky, Charles, Assist. Project Engr.
Boggio, Marshall R., Test Assist.
Borcherdt, Walter O., Sr. Project Engr.
Boroson, N. Harvey, Assoc. Engr.
Brown, Wilbert R.
Burdett, Harry W., Jr., Chief Engr.
Cadwell, Gaius, Sr. Project Engr.
Condello, Vincent, Chief Design Engr.
Conlon, John W., Sr. Service Rep.
Cramer, Granville R., Assist. Project Engr.
Cutting, John B., Product Engr.
Davidson, William M., Mgr., Applic. Engr.
Dexter, Frederick V., Product Engr.
Eaton, David C., Works Mgr.
Emrick, William H., Project Engr.
Fay, James W., Treasurer
Ferris, DeLacy F., Chief of Prelim. Design
FitzGerald, James W., Prod. Projects Engr.



Fox, Zola, Sr. Project Engr.
Frank, John E., Engr., Instrumentation
Frazee, Richard P., Mgr. of Contracts
Gershon, Milton, Sr. Project Engr.
Goalwin, Daniel S., Project Engr.
Govignon, Edward C., Project Engr.
Guzeko, Max E., Service Rep.
Harslem, Eric W., Chief, Test Dept.
Huson, George R., Devel. Engr.
Irgon, Joseph, Chief Analyst
Jermain, Robert A., Product Engr.
Kellar, David G., Mgr., Ind. & Public Relations
Kessler, Edward R., Assoc. Engr.
Kimm, Willard C., Dir. of Pub. Relations
Kinsey, Robert S., Vice Pres. of Operations
Kircher, Hartmann J., Sr. Project Engr.
Kopituk, Raymond C., Chief, Materials Engr.
Lawrence, Robert M., Assist. Treasurer
Lehrer, Stanley, Project Engr.
Lyons, Harold R., Product Engr.
MacMorris, David, Product Engr.
Mann, David J., Chief, Prop. Synthesis Dept.
Mayer, F. Robert, Public Relations
Michaels, Henry B., Jr., Exec. Vice Pres. & Assist. Gen. Mgr.
Munger, William P., Mgr. of Engng. & Res. Div.
Nemick, Stanley J., Product Engr.
Olsen, Marvin N., Chief Physicist
Parker, Maurice E., Experimental Projects Engr.
Pederson, Haakon O., Sr. Project Engr.
Raines, Thaddeus J., Chief, Propellant Properties Dept.
Rapp, Louis R., Director of Chemistry
Reinhardt, William J., Tech. Planning Engr.
Rogers, John M., West Coast Rep.
Roher, William C., Public Relations
Rothmayer, Noel Y., Project Engr.
Salzman, Jerome, Assist. Project Engr.
Sherman, Arthur, Sr. Project Engr.
Shesta, John, Consultant
Sweetman, Willard Jr., Assist. Mgr.
Thatcher, Albert G., Chief, Projects Oper. Dept.
Turner, Warren P., Mgr., Customer Relations
Walsh, Edward B., Supvr. of Planning
Weisenberg, Irwin J., Sr. Project Engr.
Witko, Joseph, Jr., Engr.
Young, Raymond W., President
Youngquist, Robertson, Chief of Applied Research & Compon. Devel.

Dayton, Ohio
Lott, G. Richard, Dayton Rep.

Los Angeles, Calif.
Eide, Ralph M., Product Engr.
Koch, Harry A., Applications Engr.

New York, N. Y.
Marston, Randoph B., Director

Washington, D. C.
Lent, Robert R., Washington Rep.
Haas, J. Donald, Assist. Washington Rep.

READING TUBE CORPORATION
READING, PA.
Meyers, George M., Exec. Vice Pres.

REED & REESE, INC.
PASADENA, CALIF.
Templeton, Thomas H., Exec. Assist to the President

REER RESEARCH, INC.,
WASHINGTON, D. C.
Martinek, Johann J. M., Dir., Res. Div.

REEVES INSTRUMENT CORP.,
NEW YORK, N. Y.
Armstrong, Niel A., Electronics Engr.
Franzel, Robert T., Aff. Mgr. Com. Prod.
Keegan, Norman R., Research Chemist
Schiff, Raymond M., Field Service Engr.

REDEL, INC,
ANAHEIM, CALIF.
Grabau, Edgar B., Research Chemist
Pitcher, Robert R., Project Leader

REINHOLD ENGNG. & PLASTICS,
NORWALK, CALIF.
Barner, William H., Sales & Devel. Engr.
Noland, Robert L., Executive Vice Pres.

REMINGTON RAND DIV.,
SPERRY-RAND CORP.,
NEW YORK, N. Y.
McKenna, Richard P., Technica] Writer

Norwalk, Conn.
Gorski, Joseph Paul, Mech. Engr.

REPUBLIC AVIATION CORP.,
FARMINGDALE, N. Y.
Bowman, Richard G., Assist. Chief Engr.
Grieco, L. Michael, Design Engr.
Helfand, Frederic E., Engng. Draftsman
Kartveli, Alexander, Vice Pres., Chief Engr.
Martin, James S., Chief, Research, Structures, Weights
O'Donnell, William J., Chief Devel. Engr.
Saul, Sol, Sr., Structures Engr.
Schneider, Mannie, Power Plant Engr.
Tint, Robert S., Design Specialist
Wakeford, Ronald C., Aeronautical Engr.
Wichser, Robert F., Chief Research Engr.

Hicksville, N. Y.
Allen, George T., Design Engr.
Brice, Philip E. R., Director of Engr.
Klein, Johann J., Chief Tech. Engr.
Melrose, Robert G., Gen. Mgr., Guided Missiles Div.
Reissig, Robert R., Admin. Engr.
Schmidt, Richard A., Chief, Prop. System

New York, N. Y.
Neuhoefer, Kurt K., Engr.
Miller, Howard L., Metalurgical Engr.

RESISTOFLEX CORPORATION,
BURBANK, CALIF.
Paulbach, Robert A., Sales Engr.

REVERE CORPORATION OF AMERICA,
WALLINGFORD, CONN.
MacDonald, Dennison H., Dir. of Res. & Engng.

RHEEM MANUFACTURING CO.,
DOWNEY, CALIF.
Beebe, Fred G., Supvr. Mfgng. Control
Clay, Willard R., Assist. Mgr.
Ellis, Emory L., Dir. Tech. Planning
Garvey, James E., Physicist
Griffiths, Franklin E., Mech. Des. Engr.
Malstrom, Carl R., Assist. Chief Engr.
Root, Robert E., Mgr.
Skrob, Richard S., Assist. to the Product Engr.
Snelling, Ken E., Customer Relations Direc.
Templin, Robert A., Project Analyst
Titley, John H., Contracts Administrator
van der Wal, Franki L., Aerodynamicist "A"
Wood, Norman E., Structures Engr.

M. H. RHODES CO., INC.,
HARTFORD, CONN.
Supina, Leo E., Consultant Physicist

RIDDLE AIRLINES,
MIAMI, FLA.
Bockoven, Arthur G., Jr. Tech.

THE ROBBINS COMPANY,
ATTLEBORO, MASS.
Bond, Laban W., Sales Mgr.

ROBBINS AND ASSOCIATES,
LOS ANGELES, CALIF.
Mabery, Henry N., Mgr., Pacific District
Robbins, Hugh C., Director

FRED T. ROBERTS & CO.,
RIDGEFIELD, CONN.
Roberts, Robert E., Vice President

ROBERTSHAW-FULTON CONTROLS CO.,
ANAHEIM, CALIF.
Wehrli, Robert L., Gen. Mgr.

ROCKET RESEARCH & ENGINEERING CO.,
SYDNEY, AUSTRALIA
Thomas, George Harold, Proprietor

ROCKEFELLER, LAURANCE
NEW YORK, N. Y.
Rockefeller, Laurance S.
Walkowicz, Teddy F., Investment Advisor
Woodward, Harper, Aviation Adviser to Laurance S. Rockefeller

ROHM AND HAAS COMPANY,
REDSTONE ARSENAL RESEARCH DIV.,
HUNTSVILLE, ALA.
McGill, Howard L., Projects Coordinator
Shuey, Henry M., Head, Ballistics Section

ROHR AIRCRAFT CORPORATION,
CHULA VISTA, CALIF.
McCreery, Frank E., Vice Pres., Engng.

ROLLS-ROYCE LTD.,
DERBY, ENGLAND
Arnold, Arthur K.

RONAN & KUNZL, INC.,
MARSHALL, MICH.
Eichstaedt, Herbert A., LOX Sales Engr.

ROYAL DUTCH AIRLINES,
SCHIPHOL AIRPORT, HOLLAND
Van Hoek, F. H. C.

ROYAL JET, INC.,
ALHAMBRA, CALIF.
Strickland, J. D., Assist. to the President

RUSSELL ASSOCIATES, INC.,
BRIGHTWATERS, N. Y.
Russell, Charles F., President

RUSSELL & HABERSTROH, INC.,
NEW YORK, N. Y.
Haberstroh, Alex, Producer

RYAN AERONAUTICAL CO.,
SAN DIEGO, CALIF.
Bates, Curtis L., Assist, Chief Engr.
Breder, Sam C., Director, Customer Service Metal Products
Clothier, Jack D., Design Engr.
Deyarmond, Albert B., Chief, Prelim. Des.
Fink, Frank W., Vice Pres., Chief Engr.
Hite, Walter A., Chief, Missile Projects Section
Kemmer, Paul H., Exec. Advisor to Vice President
Kochis, Thomas R., Prelim. Design Engr.
O'Rourke, Neil W., Power Plant Engr.
Tearnen, John O., Design Specialist
Wigers, Allan B., Electrical Engr.

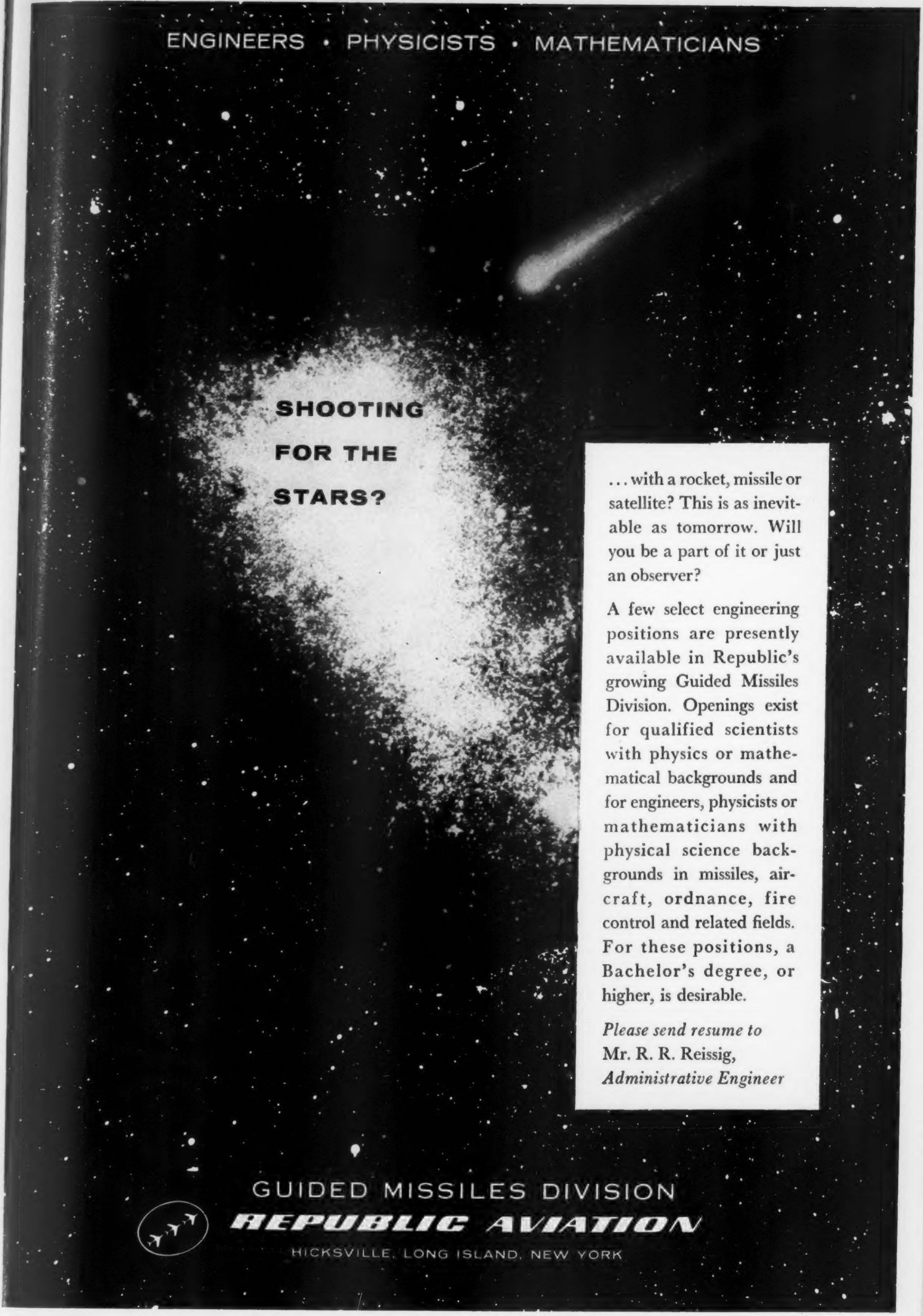
SAAB AIRCRAFT COMPANY,
LINKOPING; SWEDEN,
Platell, Ove B., Servo Engr.

ST. REGIS SALES CORP.,
CHICAGO, ILL.
Moldt, Verne G., Sales Engr.

SANDIA CORPORATION,
ALBUQUERQUE, N. M.
Dieruf, Burton E., Staff Member

SCHREIBER BROS.,
BEAUMONT, TEXAS
Schreiber, Charles B., Owner

SCIENTIFIC DESIGN CO.,
NEW YORK, N. Y.
Brown, David, Assist. V. P., Devel.


ENGINEERS • PHYSICISTS • MATHEMATICIANS
SHOOTING FOR THE STARS?
. . . with a rocket, missile or satellite? This is as inevitable as tomorrow. Will you be a part of it or just an observer?
A few select engineering positions are presently available in Republic's growing Guided Missiles Division. Openings exist for qualified scientists with physics or mathematical backgrounds and for engineers, physicists or mathematicians with physical science backgrounds in missiles, aircraft, ordnance, fire control and related fields. For these positions, a Bachelor's degree, or higher, is desirable.
Please send resume to
Mr. R. R. Reissig,
Administrative Engineer
GUIDED MISSILES DIVISION
REPUBLIC AVIATION
HICKSVILLE, LONG ISLAND, NEW YORK

SEABOARD AND WESTERN AIRLINES, NEW YORK CITY, N. Y.
Jorgensen, Walter T., Flight Engr.

SEAMLESS PRODUCTS CO., INC.,
Polikoff, Rouvime B., Vice President

SELAS CORPORATION OF AMERICA DRESHER, PA.
Beatrice, Joseph V., Design Draftsman

SEQUOIA PROCESS CORPORATION, REDWOOD CITY, CALIF.
Graham, Beardsley, Executive Vice Pres.

SERVOMECHANISMS, INC., HAWTHORNE, CALIF.
Zoike, Helmut M., Staff Specialist

W. S. SHAMBAN & CO., CULVER CITY, CALIF.
Shamban, Wm. S., Gen. Mgr.

SHELL CHEMICAL CORP., NEW YORK, N. Y.
Houston, Colin Alexander, Sr. Technologist

SHELL DEVELOPMENT CO., EMERYVILLE, CALIF.
Sorem, Stanley S., Research Supvr.

SHELL OIL COMPANY, WOOD RIVER, ILL.
Greenshields, Robert S., Director of Res.

SIMMONDS AEROCESSORIES, INC., TARRYTOWN, N. Y.
Enyart, William R., President
Fishman, Bernard, Project Engr.

S-K-C RESEARCH ASSOCIATES, PATERSON, N. J.
Shaw, John D., President

A. O. SMITH CORP., MILWAUKEE, WISC.
Brock, Harold W., Division Mgr.
New York, N. Y.
Moskovics, Frederick E., Indus. Consultant

SMITH, BARNEY & CO., NEW YORK, N. Y.
Harding, Wm. Barclay, Partner
Titus, Richard H., Security Analyst

SOCIETE D'ETUDE DE LA PROPULSION PAR REACTION, PARIS, FRANCE
Florio, Fernand, Technical Director

SOCIETE NATIONALE DE CONSTRUCTIONS AERONAUTIQUES DU SUD-OUEST, PARIS, FRANCE
Cornillon, Jacques M., US Tech. Rep.
Delval, Georges T., Attache to Tech. Bd.
Girard, Jean, Ingenieur en Chef des Essais en Vol
Servanty, Lucien, Chief Engr.
Vinsonneau, Fernand Gabriel, Director Technique

SOCONY MOBIL OIL CO., PAULSBORO, N. J.
Albright, Ralph E., Res. & Devel. Dept.

SOLAR AIRCRAFT CO., SAN DIEGO, CALIF.
Cremer, George D., Sr. Staff Engr.
Oberg, Cyril D., Mgr., Contracts Div.
Palmtag, Herbert M., Missile Sales, Corp.

W. A. SOUCY SCIENTIFIC RES., MONTREAL, CANADA
Soucy, William A.

SOUTHERN DAIRIES, INC., WASHINGTON, D. C.
Giles, William E., Steam & Refrigeration Engr.

SOUTHWEST PRODUCTS CO., DUARTE, CALIF.
Hackman, K. V., President & Gen. Mgr.

SOUTHWEST RESEARCH INSTITUTE, SAN ANTONIO, TEXAS
Carlton, Clarence H., Assoc. Chem. Engr.
Harmon, Fred, Vice President
Moffitt, John V., Project Engr.
Warren, Francis A., Propellant Technologist
Wiegand, James H., Chairman, Dept. Chem. & Chem. Eng.

SPACO, INC., NEW YORK, N. Y.
Kerry, Frank G., Manager

SPEER CARBON CO., ST. MARY'S, PA.
Harvey, I. L., Service Engr.

SPERRY GYROSCOPE CO. DIV., SPERRY RAND CORP., GREAT NECK, N. Y.
Halperin, Herbert H., Sales Engr.
Petersen, Norman V., Engr.
Sammis, Edward, Sr. Engr.
Wheeler, James W., Director, Instrument Engng.

STANDARD OIL CO., CLEVELAND, OHIO
Krause, Warren H., Process Engr.

STANDARD RAILWAY EQUIPMT. MFG. CO., CHICAGO, ILL.
Fraenkel, Stephen J., Director of Research

STANFORD RESEARCH INSTITUTE, MENLO PARK, CALIF.
Ablow, Clarence M., Mathematician
Arnold, James S., Physicist
Casler, William A., Research Coordinator
Cogswell, S. A., Sr. Economist
Cook, Charles J., Physicist
Evans, Marjorie W., Sr. Physicist
Given, Frank I., Research Engr.
Hiester, Nevin K., Mgr., Chemical Engng. Section

STAUFFER CHEMICAL CO., NEW YORK, N. Y.
Terlizzi, Paul M., Assist. to Director of Market Devel.

STAVID ENGINEERING, INC., PLAINFIELD, N. J.
Fogel, Lawrence J., Research Consultant

STE. AIR LIQUIDE, PARIS, FRANCE
DeLorme, Jean, President

STROUKOFF AIRCRAFT CORP., TRENTON, N. J.
Stroukoff, Michael, Pres. & Chief Engr.

STUDEBAKER-PACKARD CORP., DETROIT, MICH.
Hartmann, Donald H., Mgr. Contract
Rodgers, Oliver E., Assist. Gen Mgr.

STUTTGART-FLUGHAFEN, STUTTGART, GERMANY
Bolkow, Ludwig, Diplomingenieur

SUN CHEMICAL CORP., EAST RUTHERFORD, N. J.
Sefchik, Francis J. J., Research Chemist

SUNDSTRAND MACHINE TOOL CO., ROCKFORD, ILL.
Sadler, Carl L., Mgr.

SWEDLOW PLASTICS CO., LOS ANGELES, CALIF.
Face, William H., Contracts Manager

SYLVANIA ELECTRIC PRODUCTS, INC., KEW GARDENS, N. Y.
Caras, Bernard, Engr.

SYSTEMS RESEARCH CORP., VAN NUYS, CALIF.
Charyk, Joseph V., V. P. & Director, Aerophysics & Propulsion Div.

TACCONE PNEUMATIC FOUNDRY EQUIP. CORP., NORTH EAST, PA.
Jones, Robert R., Supervisor

WALTER DORWIN TEAGUE ASSOCIATES, NEW YORK, N. Y.
Teague, Walter Dorwin, Jr., Partner

TECHNICAL SPECIALTIES, INC., COLUMBUS, OHIO
Pierce, James G., President

T.E.C.O., LTD., TORINO, ITALY
Robotti, Aurelio C., Mech. & Aero. Engr.

TELECOMPUTING CORPORATION, NO. HOLLYWOOD, CALIF.
Taylor, Trude C., General Sales Mgr.

TEMCO AIRCRAFT CORP., DALLAS, TEXAS
Bender, William H., Sr. Oper. Res. Engr.
Crook, Norman L., Sr. Group Engr.
Freeman, William B., Tech. Director
Jones, Robert F., Engr.
Marx, Howard F., Head, Oper. Analysis
Palley, I. Nevin, Vice President, Engng.
Pearson, Chas. Robert, Engng., Des. "A"
Williamson, Robert H., Airplane Des. Engr.

THE TEXAS CO., NEW YORK, N. Y.
Brown, William H., Laboratory Tester
Kemp, Lebbeus C., Jr., General Mgr.
Kuhn, Wayne E., Gen. Mgr., Research & Tech. Dept.

TEXAS METAL AND MANUFACTURING CO., INC., DALLAS, TEXAS
Bell, Carroll L., Project Eng.
Kershaw, George C., Vice President
McGee, Henry I., President
Sindelar E. C., Project Eng.
Smith, Robert J., Jr., Design Study Eng.

THIEBLOT AIRCRAFT COMPANY, BETHESDA, MD.
Kirby, J. Robert, Chief, Tech. Dept.
Maloney, William
Smith, Frank C., Project Stress Engr.
Washington, D. C.
Raffel, Zanville M., Project Supervisor
Thieblot, Armand J., President

THIOKOL CHEMICAL CORPORATION, TRENTON, N. J.
Ferguson, Harry R., Vice President
Elkton, Md.
Guzzo, Anthony T., Chemical Engr.
Higginson, John, Gen. Mgr.
Mull, Irvin W., Chemist
Reilly, Hugh T., Test Engr.
Stern, Edward S., Process Engr.
Wilhite, V. H. Bryce, Chief Engr.
Huntsville, Ala.
Anderson, Frank P., Chemist
Buchanan, Jack, Chief Test Engr.
Goodloe, John H., Project Engr.
Lawrance, John O., Chief, Plant Security Dept.
Mebane, William M., Gen. Mgr.
Myers, Daniel B., Project Engr.
Nielsen, Paul R., Mech. Engng.
Nocke, Henry H., Project Chemist
Portas, William R., Design Engr.
Ritchey, Harold W., Tech. Director, Rocket Divisions

Roberts, Charles S., Jr., Project Engr.
Weber, Matthew, Jr., Chief Chemical Engr.
Wiggins, Joseph W., Chief Engr.

Marshall, Texas
Burkett, Thomas W., Admin. Supvr.
Holley, Herschel Q., Propellant Plant Mgr.
Ignatius, Wm. R., Gen. Mgr.

JOHN I. THOMPSON & COMPANY, WASHINGTON, D. C.
Garner, Robert W., Principle Project Engr.

THOMPSON PRODUCTS, INC. CLEVELAND, OHIO
Angell, Pierce T., Div. Mgr.
Aspelin, Leslie L., Engng. Mgr.
Colwell, Archie Trescott, Vice President
Gregory, John R., Mgr., Aircraft Division
Hess, Anton, Design Engr.
Koffel, John K., Product Engng. Mgr.
Kresse, Arthur O., Project Engr.
Lazo, Luis R., Devel. Engr.
Pomeroy, Andrew L., Assoc. Director, Staff Res. and Devel.
Rapp, Edward G., Sr. Project Engr.
Riley, Edward P., Vice President
Shepard, Horace A., Vice President

TIMBROL, LTD., RHODES, AUSTRALIA
Ward, Ronald Bentley R., Draftsman

TRAID CORP., SHERMAN OAKS, CALIF.
MacIntosh, Mark, Vice President
Peterson, Rowland F., Sales Mgr.
Roberts, Fred G., Jr., President

TRANS WORLD AIRLINES, SAN FRANCISCO, CALIF.
Peck, M. Edward, Transportation Agent

TRIANGLE PUBLICATIONS, INC., PHILADELPHIA, PA.
Metz, Walter C., Jr. Expeditor

TRU-SCALE, INC., WICHITA, KANSAS
Paul, Lewis A., President

TUBE REDUCING CORPORATION, WALLINGTON, N. J.
Brown, Graham B., Works Mgr.

TUCSON REALTY & TRUST CO., TUCSON, ARIZ.
Lanctot, John W., Engr.

TUMORKIN, MORGAN & EMERMAN, NEW YORK, N. Y.
Bridge, James A., Elec. Engr.

TURBO RESEARCH CORPORATION, SANTA MONICA, CALIF.
Kimball, John G., President

UNIFLOW MFG. CO., ERIE, PA.
Bayston, John R., Engng. Consultant

UNION CARBIDE & CARBON CORP., NEW YORK, N. Y.
Murphy, John J., Director of Patent Affairs

UNION OIL COMPANY OF CALIFORNIA BREA, CALIF.
Keller, Dr. James L., Sr. Section Leader
Lakin, Wilford P., Sr. Section Leader

UNITED AIRCRAFT CORPORATION, EAST HARTFORD, CONN.
Blackman, Arthur W., Jr., Research Engr.
Dolinger, Sheldon, Analysis Engr.
Gabron, Frank, Research Engr.
King, Charles H., Jr., Liaison Engr.
Kuehl, Donald K., Research Engr.
Kuhrt, Wesley A., Chief Research Engr.
Landerman, Abraham M., Analytical Engr.
Lee, John G., Director of Research
Perry, Edward C., Jr., Group Leader
Pfannebecker, George W., Research Engr.
Terwilliger, Roy L., Assist. Equipment Engr.

Hamilton Standard Div., Windsor Locks, Conn.
Baker, Carl F., Quality Mgr.

Pratt & Whitney Aircraft Div., East Hartford, Conn.
Bazzano, Joseph T., Exp. Const. Process Planner
Caouette, Zephirin, Jr. Designer
Edwards, Shelton H., Test Engr.
Faitani, Joseph J. Test Engr.
Horan, John J., Test Engr.
Lavelle, Joseph E., Design Engr.
Mongiat, Robert, Design Engr.
Norman, Neil, Test Engr.
Parkins, Wright A., Engng. Mgr.
Rising, Simeon M., Jr., Installation Engr.
Steele, Alan E., Analytical Engr.
Thompson, Robert A., Exeprimental Test Engr.
Verkouille, Robert D., Design Engr.

Sikorsky Aircraft Div., Bridgeport, Conn.
Myslak, Thaddeus B., Flight Res. Engr.
Sikorsky, Igor I., Engng. Mgr.

UNITED CONTROL CORP., SEATTLE, WASH.
Newhart, Duane C., Quality Control, Chief Tooling Insp.

UNITED SASH & DOOR CO., WICHITA, KANSAS
Hoult, Charles H., President

U. S. STEEL CORP., CONSOLIDATED WESTERN STEEL DIV., LOS ANGELES, CALIF.
Fenninger, Charles R., Contracting Engr.
Fife, Charles E., Contracting Engr.
Hester, J. G., Project Mgr.
Johnson, Morris E., Contracting Engr.
Klick, M., Chief Engr.
Paterson, Lawsome, Contracting Engr.
Ritchey, Randolph, Mgr., Aircraft & Missle Div.
Thompson, J. Greer

UNITED STATES TIME CORP., NEW YORK, N. Y.
Boehm, Gerhard W., Eastern Sales Mgr.

VALLEY INSURANCE AGENCY, LAS CRUCES, N. M.
Freudenthal, Louis E., Owner

VAN DYKE TEXTIGRAPH COMPANY, INC., CHATTANOOGA, TENN.
Van Dyke, William D., Vice Pres., Engng.

VARD, INC., PASADENA, CALIF.
Kozich, Steve S., Mech. Engr.

VICKERS, INC., DIV., SPERRY RAND CORP. DETROIT, MICH.
Caulkins, David R.
Dutton, James M., Application Engr.

VITRO CORP., SILVER SPRING, MD.
Knox, Thomas B., Assist. Dept. Head

H. A. WAGNER CO., VAN NUYS, CALIF.
Lahde, Reinhard N., Research Physicist
Mastrocola, Nicholas, Project Engr.
Smith, William W., Engr., Electronic & Field
Wagner, Herbert A., Pres. & Chief Engr.

STEPHEN M. WAGNER, INC., ST. LOUIS, MO.
Wagner, Edward W., Vice President

WALL CRYOGENICS, INC.,
LINDEN, N. J.

Meisler, Joseph, Director of Engng.

WALTER MOTOR TRUCK CO.,
BROOKLYN, N. Y.

Goodman, Leon J., Design Draftsman

WARREN BROTHERS ROADS CO.,
CAMBRIDGE, MASS.

Ehrsam, George W., Sales Mgr.

WARREN WEBSTER & CO.,
CAMDEN, N. J.

Arlington, Sterling F., Design Engr.
Webster, Warren, President

THE WEATHERHEAD COMPANY,
CLEVELAND, OHIO

Allan, William S., Project Engr.
Gannett, Wright K., Assoc. Director of Res. and Devel.

WEIDER PUBLICATIONS, INC.,
LEVITTOWN, N. Y.

Hennesey, Hal M., Editorial Director

GEO. E. WELLS, INC.,
ST. LOUIS, MO.

Wells, Willis L., President

WESTERN AIRMOTIVE COMPANY,
OAKLAND, CALIF.

Mhoon, S. McKee

WESTERN ELECTRO-ACOUSTIC LABORATORY,
LOS ANGELES, CALIF.

Veneklasen, Paul S., Director

WESTERN ELECTRIC COMPANY,
NEW YORK, N. Y.

Link, Arthur C., Project Mgr.

South Kearny, N. J.
MacDonald, John F., Field Engr.
Schroder, William R., Time & Motion Engr.

Winston-Salem, N. C.
Kemp, Barron, Assist. Engr.

WESTERN GEAR CORP.,
LYNWOOD, CALIF.

Acurso, Louis A., Gen. Supvr., Engng.
Bannan, Bernard J., Vice Pres., Gen. Mgr.
Bauer, Richard L., Assist. Supvd., Engng.
Butterbaugh, Galen P., Project Engr.
Clark, Gerald I., Engr.
Morris, John K., Mgr. of Engng.

WESTINGHOUSE AIR BRAKE CO.,
WILMERDING, PA.

Hewitt, E. E., Chief Eng.

WESTINGHOUSE ELECTRIC CORP.,
PITTSBURGH, PA.

Augustine, Pat R., Atomic Reactor Engr.
Bergvall, Royal C., Engr. Mgr.
DeLateur, Louis A., Control Engr.
Kropf, Victor J., Assist. to Sales Mgr.
Way, Stewart, Sec. Mgr., Thermodynamics

Air Arm Division, Baltimore, Md.
Bauman, Ralph E., Electrical Engr.
Ellrod, Harold D., Assist. Sales Mgr.
McCourt, Andrew W., Mgr., Analytical Section
Paz, Joe M., Design Engr.

Aviation Gas Turbine Div., Kansas City, Mo.
Hannum, Richard W., Combustion Devel. Engr.
Palmer, Sidney Christian, General Mgr.
Pouchot, Walter D., Section Engr., Combustion Devel.

Electronic Tube Div., Elmira, N. Y.
Harrod, Harvey T., Mgr., Govt. Contract Administration

Lima, Ohio
Miner, John D., Jr., Engng. Mgr.

Patrick AFB, Fla.
Spontak, Joseph, Electronic Engr.

Youngwood, Pa.
Le Frois, Richard T., Device Devel. Tech.

WESTREX CO. CARIBBEAN,
BOGOTA, COLOMBIA, S.A.

De Boer, Jan Jacob, Mgr.

J. WHEELOCK ASSOCIATES,
NEW YORK, N. Y.

Wheelock, J. A., President

WHITE-RODGERS ELECTRIC COMPANY,
ST. LOUIS, MO.

Durham, Charles Eastman, Chief Administrative Engr.

WILDENSTEIN & CO., INC.,
NEW YORK, N. Y.

Weber, Clare

WILLYS OVERLAND MOTORS,
TOLEDO, OHIO

Canady, Ward M., Chrm. Finance Com.

WYANDOTTE CHEMICALS CORP.,
WYANDOTTE, MICH.

Cuddy, William Anthony, Project Leader
Graham, Donald A., Mgr. of Contract Res.

WPTZ,
PHILADELPHIA, PA.

Obrien, Richard W.,

YALE STAMPING CO.,
DETROIT, MICH.

Bagley, Bruce R., Vice President

YOUNG DEVELOPMENT LABORATORIES, INC.,
ROCKY HILL, N. J.

Smith, Kenneth W., Chief Engr.

A. M. ZAREM & ASSOCIATES,
LOS ANGELES, CALIF.

Zarem, Abe M., Owner

ZELAIR CORPORATION,
DEFIANCE, OHIO

Nischwitz, Ned Robert

JOHN C. ZOLA LABORATORIES,
ALHAMBRA, CALIF.

Zola, John C., Director

As Higher and Higher Altitudes Are Attained STRATOPOWER HYDRAULIC PUMPS ARE THERE...

AND—NOT JUST FOR THE RIDE!

Design for tomorrow's aircraft! That's the keynote of the engineering back of the new STRATOPOWER Hydraulic Pumps. Aircraft, Rockets, Guided Missiles or Satellites . . . the PUMP is vital to the successful performance of the project. Engineers responsible for the design of hydraulic systems for these vehicles provide a sure source of Fluid Power with—

STRATOPOWER®

HYDRAULIC PUMPS

Series 65F Fixed Displacement Pump

Series 65W Variable Delivery Pump

The 65F Series Fixed Displacement Pumps and the 65W Series Variable Delivery Pumps are designed to operate dependably at temperatures in excess of 400°F and at drive speeds of over 10,000 rpm. These Pumps are light in weight and have exceptionally high horsepower/weight ratios. The new STRATOPOWER design can easily be adapted to fit special requirements to save space and weight in aircraft and missiles where every pound saved is truly more than worth its weight in gold.

In the air and on the ground, STRATOPOWER Hydraulic Pumps assure reliable hydraulic Utility Systems and Boost Systems, and add to the high performance requirements of Auxiliary Power Units, Radar Scanners and Stabilized Platforms.

WATERTOWN DIVISION
The New York Air Brake Company
730 Starbuck Ave., Watertown, N. Y.

I would like more information on STRATOPOWER Series 65 Hydraulic Pumps.

Name__________ Title__________

Company__________

Address__________

City__________ Zone______ State______

WATERTOWN DIVISION
THE NEW YORK AIR BRAKE COMPANY
STARBUCK AVENUE • WATERTOWN • N. Y.
INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

EDUCATIONAL INSTITUTIONS

ACADEMY OF AERONAUTICS, LA GUARDIA AIRPORT, FLUSHING, N. Y.

Amundjen, Einar K., Instructor
DeMarco, Michael F., Instructor
Greenwood, Stuart W., Lecturer
Hautau, Ralph H., Instructor
Terry, David, Instructor

Students

Alvarez, Raoul
Augost, Arthur
Baetz, Harold F.
Bunker, Leonard R.
Buxo, Vincent M.
Buxton, John A.
Cooper, Joseph
Corso, John S.
Dennis, John E.
Durante, Benjamin M.
Fingeret, Harold
Ford, Frank J.
Frank, Anthony J.
Goldstein, Leonard
Havriliak, Alexander
Heim, Donald J.
Ilijic, Thomas A.
Janovsky, Robert E.
Katz, Arthur
Knissel, Eugene A.
Kocka, Ronald F.
Lange, Norman
Maisel, Harrell
Marmorale, Anthony
Mereness, Donald S.
Metz, Thomas
Mittelhammer, Jr.
Montusi, Robert R.
Paulos, George
Popolo, Joseph J.
Ragusa, Michael P.
Salvato, Vito C.
Schneiderman, Gordon R.
Schnur, Albert P.
Shapiro, Harold
Smith, John J.
Sweeney, Edward F., Jr.
Tierney, James A.
Varvaro, Anthony J.
Weseliza, Maurice A.

AMERICAN INTERNATIONAL COLLEGE, SPRINGFIELD, MASS.

Student

Ivory, John F.

ARKANSAS, UNIVERSITY OF, FAYETTEVILLE, ARK.

Students

Miller, Brian S.
Myers, William A.
Rakes, Sam L.

BOSTON UNIVERSITY, BOSTON, MASS.

Student

Smith, Roland

BROOKLYN COLLEGE, BROOKLYN, N. Y.

Student

Foley, Robert A.

BROWN UNIVERSITY, PROVIDENCE, R. I.

Maeder, Paul F., Prof of Engng.

BUFFALO, UNIVERSITY OF, BUFFALO, N. Y.

Students

Beswick, Richard
Murphy, Richard P.
Rifkin, Sheldon
Romanczuk, Walter
Shafran, Allen J.
Sugarman, Michael N.
Vasilion, Peter

CALIFORNIA INSTITUTE OF TECHNOLOGY, PASADENA, CALIF.

Dauwalter, Chadwick S., Graduate Student
Elliott, James P.
Penner, S. S., Associate Professor of Jet Propulsion
Williams, Max L., Jr., Associate Professor of Aeronautics
Zwicky, Fritz, Professor of Astrophysics

Students

Hall, James N.
Harshbarger, Frederick C.
Katz, Robert
Ladd, Alvin W.
Williams, Forman A.

Jet Propulsion Laboratory

Altman, David, Chief, Chemistry & Physics Section
Atkisson, James B., Mgr., Mechanics
Barker, Calvin L. R., Research Engineer
Bell, Gilbert L., Engineering Group Supervisor
Bolton, Marquis W., Engineer, Jet Propulsion Laboratory
Bowersox, Ralph B., Research Group Leader
Briglio, Anthony Jr., Engineering Specialist
Cole, Charles W., Chief, Design & Development Section
Cummings, Clifford I., Section Chief
Elverum, Gerard W., Jr., Research Engineer
Froehlich, Jack E., Division Chief, Guided Engineering
Fuhs, Allen E., Graduate Research Assistant
Gernandt, Herbert H., Engineering Designer
Hall, Kimball P., Senior Research Engineer
Harrje, David T., Research Engineer
Haurlan, Peter N., Chief, Military & Industrial Services
Hazard, Allyn B., Propulsion Supervisor
Lang, Theodore E., Draftsman-Designer
Nielsen, Julian J., Engineer
Ofer, Joseph T., Senior Industrial Engineer
Peebles, Lester H., Development Engineer
Powell, Walter B., Engineering Specialist
Richardson, Al, Technical Writer
Robillard, Geoffrey, Section Chief, Solid Rockets
Rose, Robert F., Chief of Propulsion Section
Rupe, Jack H., Senior Research Engineer
Shafer, John I., Staff Engineer
Stipe, Chester R., Research Engineer
Talbert, John Wilkie Jr., Senior Field Engineer
Typaldoz, Z. A., Research Engineer
Wilson, Earl L., Development Engineer
Wolfe, Allen E., Research Engineer
Wright, F. Hamilton, Senior Research Engineer
Zucoski, Edward E., Research Engineer

CALIFORNIA, UNIVERSITY OF, BERKELEY, CALIF.

Morrison, Donald C., Research Chemist
O'Brien, Morrough P., Dean
Oppenheim, Antoni K., Associate Professor of Mechanical Engng.
Riggs, Ramon Winston

Students

Brown, James E.
Conel, Carol L.
Dorman, Burton P.
Gerdes, Ronald Mampre
Goldenberg, Alfred D.
Haughian, James M.
Klamt, Robert H.
Lear, Charles W.
Levenson, Leonard Lionel
Silva, Richard W.

CALIFORNIA, UNIVERSITY OF, DAVIS, CALIF.

Leonard, Arthur S., Specialist: Agriculture and Lecturer

CALIFORNIA, UNIVERSITY OF, LIVERMORE, CALIF.

Mills, Mark M., Head, Theoretical Division

CALIFORNIA, UNIVERSITY OF, LOS ANGELES, CALIF.

Kaplan, Joseph, Professor of Physics

Students

Bennett, Kelly R.,
Gross, Bernard
Yakow, Gilbert

CALIFORNIA POLYTECHNIC INSTITUTE, SAN LUIS OBISPO, CALIF.

Student

Dean, James M.

CARNEGIE INSTITUTE OF TECHNOLOGY, PITTSBURGH, PA.

Archer, David H., Assistant Professor

Student

Bane, James Jr.

CASE INSTITUTE OF TECHNOLOGY, CLEVELAND, OHIO

Burlage, Henry Jr., Director, Propulsion Laboratory

Students

Eckstein, Royal W., Jr.
Fraver, William C.
Sabolic, Victor V.
Winter, Henry F.

CENTRAL STATE COLLEGE, EDMOND, OKLA.

Student

Dukeminier, Johnny W.

CHICAGO, UNIVERSITY OF, CHICAGO, ILL.

Student

Sagan, Carl E.

CINCINNATI, UNIVERSITY OF, CINCINNATI, OHIO

Elnan, Odin R. S., Instructor, Aero Engineering
Kettling, George E., Graduate Student

Rivers, Jack L., Physicist

Student

Hood, Hershel O.

CITY COLLEGE OF NEW YORK, NEW YORK, N. Y.

Students

Dunkel, Harry
Grosewald, Peter
Millan, Raul

CITY COLLEGE OF SAN FRANCISCO, SAN FRANCISCO, CALIF.

Student

Maxwell, Kenneth A.

CLARK UNIVERSITY, WORCESTER, MASS.

Student

Morin, Wilfred W.

COLORADO, UNIVERSITY OF, BOULDER, COLO.

Anderson, Milton D., Aero. Powerplant Development Engineer
Zimmerer, Robert W.

COLUMBIA UNIVERSITY, NEW YORK, N. Y.

Vasiliu, John, Research Engineer

Students

Huebner, Albert L. C.
Kallis, Stephen A.

COLUMBIA UNIVERSITY, NEW YORK, N. Y.

Institute of Flight Structures

Bleich, Hans H., Director

Students

Dillon, Oscar W.
Sackman, Jerome L., Guggenheim Fellow
Shaw, Richard Paul, National Science Foundation Fellow

COOPER UNION SCHOOL OF ENGINEERING, NEW YORK, N. Y.

Students

Phillips, Michael
Rosengarten, Jacob

CONNECTICUT, UNIVERSITY OF, STORRS, CONN.

Students

Dunnebier, Conrad E.
Perkins, Lincoln C.

CREIGHTON UNIVERSITY, OMAHA, NEBRASKA

Student

Slaughter, John C.

DARTMOUTH COLLEGE, HANOVER, N. H.

Browning, James A., Assistant Professor of Mechanical Engng.

Student

Blair, Robert G.

DEFIANCE COLLEGE, DEFIANCE, OHIO

Student

Noble, John D.

DREXEL INSTITUTE OF TECHNOLOGY, PHILADELPHIA, PA.

Student

Holston, Robert E.

DUSABLE HIGH SCHOOL, CHICAGO, ILL.

Lucus, James W., Physics Instructor

FENN COLLEGE, CLEVELAND, OHIO

Student

Lorenzo, Carl F.

GEORGIA INSTITUTE OF TECHNOLOGY, ATLANTA, GA.

Students

Ewell, Jack
Friedrich, Benno C.
Schalow, Peter S.

GEORGE WASHINGTON UNIVERSITY, FREDERICK, MD.

Comstock, Richard V., Senior Research Technician

HARVARD UNIVERSITY, CAMBRIDGE, MASS.

Student

Ross, Stanley

HUNTER COLLEGE, BRONX, N. Y.

Student

Delaney, Michael J.

ILLINOIS, UNIVERSITY OF, URBANA, ILL.

Students

Johnson, Eric K.
White, Raymond E., Jr.
Young, Stanislaus K. P.

INDIANA TECHNICAL COLLEGE, FT. WAYNE, IND.

Baker, Norman L., Graduate Student

Students

Adams, Edward W.
Bakow, Leon
Beltran, Henry
Bowers, Paul L.
Brinckerhoff, Richard C.
Brobst, John A.
Brown, Vernay L.
Cavanagh, Joseph F.
Censak, Robert J.
Couture, Warren A.
Culp, Donald William
Dawley, Richard E.
Dunkelberger, William R.
Gerhardstein, Kenneth R.
Gilbertson, John E.
Grepke, Harry A.
Gurski, Guy S.
Hart, Richard H.
Herald, Paul D.
Holl, Richard M.
Hughes, Ronald D.
Hunkler, L. Thomas
Hunt, Harold E.
Katanik, Michael
Kwaczala, Charles Joseph Jr.
McFarland, Stanley
Merlino, Harry D.
Parlante, Elmer J.
Parman, Payton E.
Pavlou, George
Pierson, Rex E., Jr.
Rathmell, Alfred R.
Rowe, Kerns E.
Schornstein, Robert J.
Seasholtz, Frank D.
Semeniuk, George M.
Storlee, Manly L.
Stults, Marion B.
Styne, Henry E.
Urdaneta, Ildemaro
Wadekamper, Lloyd R.
Winchester, William G.
Woodridge, Roy D.
Zadel, Anton J.

INTERNATIONAL BUSINESS COLLEGE, FT. WAYNE, INDIANA

Student

Kraick, George A.

THE JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD.

Applied Physics Laboratory

Berl, Walter G., Chemist
Dembrow, Daniel W., Chemist
Elward, Joseph F., Assistant Engineer
Gibson, Ralph E., Director
Lecat, Robert J., Associate Engineer
Schmidt, Ernest E., Assistant Engineer
Stearns, Russell C., Design Draftsman
Yeh, Hsuan, Associate Professor

KENTUCKY, UNIVERSITY OF, LEXINGTON, KY.

Lange, Karl O., Professor Mechanical Engineering

LAWRENCE INSTITUTE OF TECHNOLOGY, HIGHLAND PARK, MICH.

Student

East, George B.

LEE COLLEGE, BAYTOWN, TEXAS

Student

Hamilton, Jerry

LEHIGH UNIVERSITY, BETHLEHEM, PA.

Students

Anastos, Philip M.
Cosgrove, George J.

LOS ANGELES CITY COLLEGE, LOS ANGELES, CALIF.

Students

Cohen, Donald
Harris, Alvin M.

LOS ANGELES STATE COLLEGE, LOS ANGELES, CALIF.

Johnston, Stewart A., Chairman, Division of Natural Sciences

Student

Chenoweth, Halsey B.

MARYLAND, UNIVERSITY OF, COLLEGE PARK, MD.

Singer, S.F., Associate Professor of Physics

Student

Schindler, William R.

MIAMI, UNIVERSITY OF, CORAL GABLES, FLORIDA

Student

Lowenthal, William S.

MASSACHUSETTS, INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.

Darling, Bradford, D.I.C. Staff Member
Divone, Louis V., Graduate Student
Finston, Morton, Assistant Professor, Aeronautical Engineering
Li, Yao T., Associate Professor
Mar, James W., Assistant Professor
Prigge, John S., Jr., Project Leader
Sandorff, Paul E., Associate Professor
Wrigley, Walter, Deputy Director, Associate Professor

Lincoln Laboratory, Lexington, Mass.

Stacey, Joseph M., Staff Member

Students

Cameron, Donald A.
Dworak, Richard G.
Jewell, William S.
Larson, Kenneth B.
Luhrmann, George W., Jr.

MICHIGAN, UNIVERSITY OF, ANN ARBOR, MICHIGAN

Adamson, Thomas C., Jr., Assistant Professor
Broadwell, James E., Associate Professor
Cullen, Robert E., Associate Research Engineer
Folsom, Richard G., Director, Engineering Research Institute
Hicks, Henry A., Associate Research Engineer
Lay, Manchiu D. S., Teaching-Fellow
Morrison, Richard B., Assistant Professor. Aero. Engng. & Supvr.
Nicolaysen, Emil, Research Assistant
Nicholls, James A., Instructor
Rice, Paul J., Research Associate
Sellars, John R., Assistant Professor Aero Engineering
Weir, Alexander, Jr., Associate Research Engineer

Students

Aoki, Kazuhiko
Arkin, Herbert Jr.
Barr, Bradford F.
Bevelheimer, Bruce L.
Brannon, Paul J.
Braunstein, Robert
Buckley, Paulita A.
Bullock, J. B.
Denman, John B.
Freeman, George L.
Gibson, John H.
Kovar, Robert P.
Kroy, Ralph E.
Moore, Fred W.
Muhrlein, Harold A., Jr.
Naugle, Gerald R.
Pierson, Arthur H.
Pietros, Roger W.
Radd, Herbert E.
Rademaker, Jack R.
Robinette, Cifford A.
Shedowsky, James P.
Signor, Richard W.
Stier, Robert M.
Ward, James E.

MICHIGAN STATE COLLEGE, EAST LANSING, MICH.

Student

Van Vechten, C. Thomas

MINNESOTA, UNIVERSITY OF, MINNEAPOLIS, MINN.

Chang, Chieh Chien, Professor of Fluid Mechanics
Earle, Albert P., Assistant Professor
Eckert, Ernest R. G., Professor of Mechanical Engineering
Hartnett, James P., Assistant Professor of M. E.
Ibele, Warren E., Assistant Professor
Irvine, T. F., Instructor
Liu, Tung-Shenq, Scientist
Spilhaus, Athelstan F., Dean

Students

Brandt, Charles A.
Butter, Charles D.
Cordes, William A.
Dorman, Frank D.
Fredlund, Norton
Grant, Kenneth O.
Horswill, James W.
Lindberg, Paul A.
Madison, Lee P.
Mills, James L.
Pearson, Merwin D.
Stankevics, Janis O. A.

MISSISSIPPI, UNIVERSITY OF, UNIVERSITY, MISS.

Student

Harper, Alfred Y.

NEWARK COLLEGE OF ENGINEERING, NEWARK, N. J.

Rose, Robert H., 2nd., Assistant Professor

Students

Hart, Alexander
Neiss, Edward S.

NEW MEXICO COLLEGE OF A & M ARTS, STATE COLLEGE, N. M.

Bean, Stewart P., Assistant Chemist
Carbine, Ivan L., Associate Electrical Engineer
Hart, Leon C., Administrative Assistant
Hennigh, Keith E., Assistant Mathematician
Moore, R. Gilbert, Associate Engineer
Mozer, Charles F., Laboratory Assistant
Sherburne, Russell K., Chief Physicist
Tombaugh, Clyde W., Chief Investigator Satellite Search

Students

Allin, Kenneth F.
Fortney, Lloyd R.
Guild, Calvin C.
Merewether, Edward K.
Tillian, Donald J.
Warrick, Stuart C., Jr.
Willis, Jerry A.

NEW ENGLAND INSTITUTE FOR MEDICAL RESEARCH, RIDGEFIELD, CONN.

Heller, John H., Executive Director

NEW YORK UNIVERSITY, NEW YORK, N. Y.

Charnoff, Lorraine, Teaching Fellow
Gilstein, Jacob B., Research Associate
Happel, John, Professor and Chairman, Department of Chemical Engineering
Maccarone, Michael B., Instructor Mechanical Engineering
Marsel, Charles J., Associate Professor Chemical Engineering
Winternitz, Paul F., Research Professor of Chemical Engineering

Students

Barkan, Marvin D.
Barrett, James
Chaplin, Leo J.
Cullinane, Henry J.
Da Puzzo, Andrew V.
Drechsel, Charles N.
Goldberg, Leon
Gordon, Gilbert
Gottlieb, Lawrence K.
Greenberg, Nathaniel F.
Hartofilis, Stavros A.
Kamenecka, Henry
Kramer, Simon B.
Ladden, Richard M.
Multer, Martin H.
Nicolaides, Nicolas
Spiegler, Stuart D.

STATE UNIVERSITY OF NEW YORK, CANTON, N. Y.

Student

Gilpin, Scott R.

NORTH CAROLINA, UNIVERSITY OF, CHAPEL HILL, NO. CAROLINA

Shawcross, William E.

NORTH DAKOTA, UNIVERSITY OF, GRAND FORKS, NO. DAKOTA

Student

Walter, Gordon L.

NORTHROP AVIATION INSTITUTE, INGLEWOOD, CALIF.

Reid, Charles T., Director of Engineering

NORTHWESTERN UNIVERSITY, EVANSTON, ILL.

Cambel, Ali Bulent, Associate Professor of Mechanical Engineering
Fenske, Russell W., Graduate Student
Schaffer, Allan, Research Fellow
Ziemer, Richard W., Research Fellow

Students

Bohrer, Lionel C.
Jovanovic, Milan K.
Ross, Peter A.
Smith, Charles H.

NOTRE DAME, UNIVERSITY OF, SOUTH BEND, IND.

Student

Rohrbach, George Edward

OHIO STATE UNIVERSITY, COLUMBUS, OHIO

Bollinger, Loren E., Research Associate
Edsa, Dr. Rudolph, Associate Professor (Supvr. of Rocket Lab.)

Students

Bender, Rudolph A., III
Crawford, Russell W.
Hendricks, Robert C.
Worley, John B.

ORANGE COUNTY COMMUNITY COLLEGE, MIDDLETOWN, N. Y.

Student

Farningham, Gilbert D.

OREGON, UNIVERSITY OF, EUGENE, OREGON

Draganov, Samuel M., Alcoa Research Fellow in Physical Chem.

PARKS COLLEGE OF AERO. TECH., EAST ST. LOUIS, ILL.

Trefny, Richard B., Director, Aero. Engineering Department

Students

Aman, Arvis A.
Anderson, Dale A.
Atkins, Kenneth L.
Augustyniewicz, Stanley W.
Bindon, Guy A. J.
Brooks, Roger R.
Brown, Francis M.
Butkewicz, Peter J.
Carter, Vondell
Figueras, Richard
Garrison, Stephen G.
Hargadon, Vincent J.
Jasinski, Richard B.
Johnston, Galen E.
Kelly, Joseph F., Jr.
Koegel, Robert J.
Koelling, Jerry J.
Kolcsey, Stephen J.

Llewellyn, James M., Jr.
Morse, Charles
Newmann, Richard D.
Panek, Gerald
Pellish, Stephan P.
Petrick, Joseph R.
Vincze, John
Walker, Harry W.
Williamson, Jerry L.
Winter, Fintan J. Jr.

PASADENA CITY COLLEGE, PASADENA, CALIF.

Student

Crowe, Thomas J.

THE PHILLIPS EXETER ACADEMY, EXETER, N. H.

Glassman, Edward B., Administrative Assistant to the Secretary

PITTSBURGH, UNIVERSITY OF, PITTSBURGH, PA.

Frank, James H.

POLYTECHNIC INSTITUTE OF BROOKLYN, BROOKLYN, N. Y.

Agosta, Vito D., Associate Professor Mechanical Engineering
Torda, T. Paul, Professor, Mechanical Engineering

Students

Allen, Frederick H.
Augart, Paul T.
Cardullo, Mario Wm.
Clark, James W.
Codispoti, Joseph J.
Cohen, Edward C.
Collins, Paul J.
Faherty, Martin P.
Gallagher, Robert D.
Hindin, Harvey J.
Lardner, Thomas
Mangels, Alfred J.
Mariano, Charles F.
Morin, Donald G.
Mootschnik, David L.
Nelson, John R.
Ortloff, Charles R.
Peinemann, Manfred
Peschke, William T.
Rahkonen, Paavo J.
Randazzo, Donald J.
Schneider, Allen J.
Schuyler, Fred
Schwaninger, John E.
Shatz, Bernard
Simons, Stevens
Stember, Jerome A.
Toma, Richard
Vincente, Francis
Watman, Herbert

PRATT INSTITUTE, BROOKLYN, N. Y.

Student

Chiei, Leon

PRINCETON UNIVERSITY, PRINCETON, N. J.

Bass, Robert W., Dept. of Mathematics
Brooks, Arnold, Gerard Swope Fellow at Princeton University
Bruck, H. W., Research Assistant
Cheng, Sin-I, Assistant Professor
Crocco, Luigi, Robert H. Goddard Professor
Fisher, Marshall H., Librarian
Glassman, Irvin, Assistant Professor
Grey, Jerry, Assistant Professor
Hilliard, Frederick E. R. D., Research Assistant
John, James E. A., Research Assistant
Kidd, Stephen, Engineering Manager
Kovitz, Arthur A., Research Assistant, James Forrestal Research Center
Layton, James P., Chief Jet Propulsion Research Engineer, James Forrestal Research Center
Marrone, Paul V., Research Assistant, Forrestal Research Center
Marshall, Otis W., Jr., Rocket Research Engr., James Forrestal Research Center
Matthews, George B., Res. Assist., Forrestal Research Center
Pitkin, Edward T., Air Reduction Co. Fellow, Forrestal Res. Cntr.
Scala, Sinclaire M., Research Fellow
Smith, Maurice H., Assist. to the Director, The James Forrestal Research Center
Summerfield, Martin, Professor
Thomas, John P., Lead Technician, James Forrestal Research Cntr.
Vega, Jose W., Assistant in Research, Forrestal Research Center

Students

Condit Ralph H.
Goldburg, Arnold
Hirschkron, Robert
McAlevy, Robert F., III
Rosen, Gerald H.
Rosner, Daniel E.
Schreier, Stefan

PUERTO RICO, UNIVERSITY OF, RIO PIEDRAS, PUERTO RICO

Davila-Aponte, Jesus, Cosmic Ray Research Associate

PURDUE UNIVERSITY, WEST LAFAYETTE, IND.

Bottorff, James A., Research Assistant
Bowlin, Robert C., Research Assistant
Brandes, Donald J., Research Assistant
Diamond, Philip M., Research Assistant
Elliott, David G., Graduate Student
Feuer, Henry, Associate Professor
Graham, Alfred R., Research Assistant
Miele, Angelo, Associate Professor
Osborn, John R., Research Assistant & Instructor
Reese, Bruce A., Associate Professor of Mechanical Engineer
Smith, Richard D., Research Assistant
Warner, Cecil F., Professor of Mechanical Engineering
Wolf, Helmut, Research Assistant
Zucrow, Maurice J., Professor of Gas Turbine & Jet Propulsion

Students

Andrews, John F.
Baggett, Philip J.
Barker, Walter M.
Bigelow, Edward B.
Blanchard, Philip W.
Bonewits, Richard E.
Brant, William W.
Bruner, Buddy L.
Bryant, Robert L.
Bunyak, Ronald S.
Carlson, Walter H.
Cirineo, Fred V., Jr.
Collins, Fred J.
Cooper, Guy F.
Crabtree, Donald
Davidson, Allen R., Jr.
Davis, John T. R.
Drynan, Ronald D.
Eckert, John A.
Fitch, Hubert
Forsmo, Dennes
Gaubate, William A.
Glahe, Fred R.
Gross, Joseph F.
Hook, Donald W.
Janes, Chesterfield H., Jr.
Jetta, Norman W.
Karges, Charles E.
King, William Ray
Kneer, Dietrich H.
Lordi, Nicholas G.
McAllister, Thomas R.
Miller, Franklin E.
Moss, David E.
Munyon, Wayne H.
Oetting, Robert B.
Oliver, James S.
Osborne, David A.
Parfitt, Vaughn R.
Patterson, Allen C.
Pruvenok, Andrew J.
Saaris, Gary
Schiewe, Robert M.
Such, Ronald W.
Swartwout, Thomas R.
Swingle, Robert L.
Tall, Wayne A.
Tarnow, Herman E.
Thomason, Dennis P.
Unger, Charles M.
Utvik, Donald H.
Vail, Gordon T., Jr.
Whitlock, Larry K.
Willer, David E.
Witherspoon, James D.
Zambo, Steve P., Jr.

RENSSELAER POLYTECHNIC INSTITUTE, TROY, N. Y.

Foa, Joseph V., Professor of Aeronautical Engineering
Lopez, Henry J., Research Assistant
Oskay, Vural, Graduate Assistant
Mattice, Hubert C., Assistant Professor of Aero. Engineering
Zabielski, Chester V.

Students

Christman, Clyde C., Jr.
Klepeis, James E.
Raney, Russell W.

RHODE ISLAND, UNIVERSITY OF, KINGSTON, R. I.

Hagist, Warren M., Assistant Professor of Mechanical Engineering

ROCHESTER, UNIVERSITY OF, ROCHESTER, N. Y.

Students

Huzzen, Carl
Richey, Willis D.
Roberts, Richard W.

SACRAMENTO JR. COLLEGE, SACRAMENTO, CALIF.

Student

Gliebe, Robert L.

ST. PROCOPIUS COLLEGE, LISLE, ILL.

Students

Beatty, Donald F.
Schima, Francis J.

ST. LOUIS UNIVERSITY, ST. LOUIS, MO.

Julius, Anthony L., Jr.

SAN DIEGO STATE COLLEGE, SAN DIEGO, CALIF.

Student

Dahlke, Hans J.

SAN FRANCISCO STATE COLLEGE, SAN FRANCISCO, CALIF.

Rose, Gerald A.

SAN MATEO HIGH SCHOOL, SAN MATEO, CALIF.

Walker, Lloyd A., Mathematics & Physics, Electronics Instructor

SANTA MONICA CITY COLLEGE, SANTA MONICA, CALIF.

Student

Clinger, Gene E.

SOUTHERN CALIFORNIA, UNIVERSITY OF, LOS ANGELES, CALIF.

Student

Hanewinckel, Doyle Jr.

SOUTHWESTERN LOUISIANA INSTITUTE, LAFAYETTE, IND.
Chieri, Pericle A., Head, Mechanical Engineering Department

STATE TEACHERS COLLEGE, FITCHBURG, MASS.
Student
Millea, Leo Jr.

STANFORD UNIVERSITY, STANFORD, CALIF.
Kline, Stephen J., Assistant Professor
Student
Mraz, Charles L.

STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.
Students
Cassidy, Thomas F.
Hoffman, Austin J.

SYRACUSE UNIVERSITY, SYRACUSE, N. Y.
Argyris, Thomas S., Assistant Professor Zoology
Jacobi, William M., Research Associate, Chemical Engineering Dept.
Werner, Julius M., Professor Mechanical Engineer
Leibson, Melvin J., Research Assistant
Macafee, Irvin M., Jr., Research Assistant
Walker, E. J., Research Associate
Students
Cary, Reuben E.
Keena, Frank J.

TEMPLE UNIVERSITY, PHILADELPHIA, PA.
Doyle, William L., Director, High Temp. & Rocket Labs.
Student
Bocher, Herman W.

TENNESSEE A and I STATE UNIVERSITY, NASHVILLE, TENN.
Ellis, Robert A., Jr., Professor of Physics

TOKYO, UNIVERSITY OF, TOKYO, JAPAN
Kumagai, Seiichiro, Professor, Director of Engineering

TEXAS, UNIVERSITY OF, AUSTIN, TEXAS
Keith, Arlando B., Graduate Student and Teaching Assistant
Scanlan, Jack A., Assistant Professor of Mechanical Engineering, Associate Director, Engines Research Labortory

TUFTS UNIVERSITY, MEDFORD, MASS.
Gibb, Thomas R. P., Jr., Associate Professor & Director Sponsored Research, Chemistry
Students
Marvin, Addison L., Jr.
Reichenbach, Frank M.
Schlesinger, Robert M.

TULANE UNIVERSITY, NEW ORLEANS, LOUISIANA
Hamblen, David P.
Whitaker, William A.
Student
Cabell, Joseph B., Jr.

UNION COLLEGE, SCHNECTADY, N. Y.
Fox, Augustus H., Professor of Mathematics
Student
Baltay, Charles

UNITED STATES MILITARY ACADEMY, WEST POINT, N. Y.
Student
Sellers, R. C., Jr.

UNITED STATES NAVAL ACADEMY, ANNAPOLIS, MD.
Student
Jenson, Gunnar S.

UTAH, UNIVERSITY OF, SALT LAKE CITY, UTAH
Student
Liddle, Sidney G.

VANDERBILT UNIVERSITY, NASHVILLE, TENN.
Student
Richardson, Edward H.

VIRGINIA, THE UNIVERSITY OF, CHARLOTTESVILLE, VA.
Scott, John E., Jr., Associate Professor of Aero. Engineering

VIRGINIA POLYTECHNIC INSTITUTE, BLACKSBURG, VA.
Student
Healy, Gerald S.

WASHINGTON, UNVERSITY OF, SEATTLE, WASH.
Brunner, William L.
Fisher, James H., Assistant Professor
Marble, Duane F. Research Assistant
Student
Tauber, Michael E.

WASHINGTON UNIVERSITY, ST. LOUIS, MO.
Michaels, Frank H.

WAYNE UNIVERSITY, DETROIT, MICH.
Donnelly, Harold Geo., Dept. Head Chemical & Metallurgical Engineering
Inger, George R., Instructor
Locke, Arthur A., Professor & Head, Dept. of Aeronautical Engng.
Rutkowski, Joseph
Thornhill, Robert B., Instructor

WESTCHESTER COMMUNITY COLLEGE, WHITE PLAINS, N. Y.
Student
Kass, Charles L.

WHITMAN COLLEGE, WALLA WALLA, WASHINGTON
Student
Lewe, Chong K.

WICHITA, UNIVERSITY OF, WICHITA, KANSAS
Students
Feirson, Sanford D.
Gerteis, Robert L.
Henderson, David M.
Shaffer, Ronald L.

WISCONSIN, UNIVERSITY OF, MADISON, WISC.
Students
Borman, Gary L., General Motors Fellow
Fenske, Ronald G.,

XAVIER UNIVERSITY, CINCINNATI, OHIO
Student
Bowie, Donald R.

YALE UNIVERSITY, NEW HAVEN, CONN.
Student
Winston, Herbert

FOREIGN

VIENNA, UNIVERSITY OF, VIENNA, AUSTRIA
Hecht, Dr. Friedrich, Professor

BRUXELLES, UNIVERSITE OF, BRUXELLES, BELGIUM
Vandenkerckhove, Jean A., Assistant

TECHNISCHE HOCHSCHULE, STUTTGART, GERMANY
Student
Koelle, Dietrich E.

MUNICH, UNIVERSITY OF, MUNICH, GERMANY
Schuette, Karl, Professor

TECHNION, ISRAEL INSTITUTE OF TECHNOLOGY, HAIFA, ISRAEL
Shafer, H. Jerome, Senior Lecturer

TOKYO, UNIVERSITY OF, TOKYO, JAPAN
Hikita, Tsutomu, Professor, Faculty of Engineering
Itokawa, Hideo H. I., Professor, Institute of Industrial Science

NORTHAMERICAN STUDIES, INSTITUTE OF, BARCELONA, SPAIN
Mateu, Pedro, Astronomer

CHULALONGKORN UNIVERSITY, BANGKOK, THAILAND
Student
Nilacupta, Prayote

ROBERT COLLEGE ENGINEERING SCHOOL, ISTANBUL, TURKEY
Blair, Philip M., Assistant Professor of Thermodynamics and Heat Power

UNITED STATES GOVERNMENT
(By States)

ALABAMA

MAYWELL AIR FORCE BASE

Foley, James, Major

REDSTONE ARSENAL

Accashian, John, Stress Analyst, Structures Dept.
Betts, Robert Earl, Chemical Engineer
Boehm, Josef, Chief, Guidance Design Section Control Lab.
Bradspies, Robert W., Private,
Bramlet, James B., Power Plant Devel. Engr.
Brooks, Everett S., Guided Missile Project Engineer
Butler, Earl M., Deputy Systems Mgr.
Champion, Jack A., Private
Dannenberg, Konrad K., Chief, Engng. Liaison Office
Davis, William A., Jr. Ordnance Engr.
Debus, Kurt H.
Deuel, Glen A., Mechanical Engr.
Dobbins, Lt. Edward B., Guided Missile Liaison Officer,
Duerr, Thomas H., Rocket Design Engr.
Esslinger, William H., Jr., Chemical Engr.
Fagan, James J., Assistant Director Guided Missiles
Ferguson, William A., Computer Instructor
Fitton, Cliff E., Jr., Chief, Design Branch
Fleming, Frank F., Ordnance Design E
Frevert, Graham C.
Graham, Donald I., Jr., Coordinator Field Protective Measures & Human Engng.,
Haeussermann, Walter, Director-Engineer,
Heimburg, Karl L., Aero Research Engineer
Hellebrand, Emil A. H., Aeronautical Devel. Engr.
Heller, Gerhard B., Research & Devel. Engr.
Henderson, George A., Chief, Reliability Branch
Hinckley, Francis F., Engineer
Hueter, Hans, Chief, Launching & Handling Equip. Lab.
Isbell, Billy S., Aeronautical Powerplant Devel. Engr.
Knothe, Adolf H., Chief, Guidance Theory Section
Koelle, Heinz Herman, Dipl.-Ing., Ac. Chief, Prelim. Des. Section
Kroll, Gustav A., Chief, Fuselage Design Section
Lindstrom, Robert E., Assistant Chief
Lynch, William L., 1st Lt. Sig. C., Instructor, Unit Chief
Maus, Hans H., Mechanical Engr.
McClard, Truman E., Test Engr.
Minter, James M., Captain, United States Army
Moore, L. Silas, Jr.
Mrazek, William A., Guided Missile Design Engr.
Newby, David H., Chief, Test & Evaluation Branch
Nicastro, Lawrence N., Ordnance Project Engr.
Nickerson, J. C., Colonel
Paludan, Charles T. N., Physicist, Guidance and Control Labs.
Raithel, Wilhelm, Chief, Structures & Mechanics Branch
Rees, Eberhard F. M., Mechanical Engr.
Reisig, Gerhard H. R., Chief, Analytical Investigations Section
Roth, Ludwig, Assistant Chief
Rudolph, Arthur, Technical Advisor to Chief Industrial Division
Schilling, Martin, Chief, Project Management Staff
Schuler, Albert E., Section Chief
Schulze, William A., Mechanical Engr.
Sherman, Robert, Captain Ordnance C
Sims, Joseph L., Aerodynamic Devel. Engr.
Sisco, Winbern O., Jr., Deputy Chief, Ammunition Division
Stamy, James L., Assistant to the Chief
Stark, Lloyd W., Assistant to Director
Strain, Bailey T., Captain, USAF, Air Force Devel. Field Rep.
Stuhlinger, Ernst, Research Engr.
Swanson, Conrad D., Physicist
Swanson, Rollin J., Lt., Ord. Corps, U. S. Army
Thornton, James O., Supvr. Aero. Power Plant Devel. Engr.
Toftoy, H. N., Brigadier General
Tschinkel, Johann G., Chief, Combustion & Fuel Section
Von Braun, Magnus, Aeronautical R&D Engr.
Von Braun, Wernher, Chief, Guided Missile Development Div.
White, Niles C., Chief, Propellant Chemistry Section
Whitley, Robert P., Project Engr.

CALIFORNIA

AMES AERONAUTICAL LABORATORY, NACA, MOFFET FIELD

Bandettini, Angelo, Aeronautical Research Scientist
Eggers, Alfred J., Chief, 10 by 14 inch Supersonic Wind Tunnel Br.
Havill, C. Dewey, Aeronautical Research Scientist
Stevens, Victor I., Chief, High Speed Research Division
Syvertson, Carence A., Aero. Research Scientist
Zeiger, Marcus A., Aero. Mechanical VII

BUREAU OF AERONAUTICS, LOS ANGELES

Seiler, Dayton A., Commander, U. S. Navy
White, Herbert M., Chief Engr.

BUREAU OF MINES, SAN FRANCISCO

Caraway, W. Hodge, Petroleum Engr.

CASTLE AFB

Shay, Michael, Major, U.S.A.

CHELI AIR FORCE STATION, MAYWOOD

Crider, Louis D., Chief, Packaging & Corrosion

CIVIL AERONAUTICS ADMINISTRATION, LOS ANGELES

Stampley, O. K., Jr., Flight Test Engr.

558th FIELD ARTILLERY MISSILE BN., LOS ANGELES

Argabrite, Alan H., Sgt.

FOREST SERVICE, SANTA BARBARA

Rigoni, Orlando P., Foreman, U. S. Government Forest Service

GEORGE AFB

Atran, Charles W., Jet Aircraft Inspector

LOS ANGELES ORDNANCE DISTRICT

Liljegren, Lyle K., Ordnance Design Engr.
Salwick, William V., Engr.

MARINE CORPS AIR STATION, EL TORO

Mileson, Major Donald F., Major, USMC

MATHER AFB

O'Toole, Patrick J., 2nd Lieutenant
Wright, Harold V., Captain USAF

NAVAL GUIDED MISSILE SCHOOL, POMONA

Davies, Henry E., Jr., Lt., U.S. Navy

NAVAL ORDNANCE LABORATORY, CORONA

Fine, Aleck, General Engineer, Naval Ordnance Laboratory

NAVAL ORDNANCE TEST STATION, CHINA LAKE

Ankeney, D. Philip, Mechanical Engr.
Bankston, Lester T., Project Engr.
Bradley, Harold H., Jr., Chemical Engr.
Campbell, Ernest D., Rocket Research Chemist
Cohen, William, Head, Component Exploration Section
Hassel, William F., Physicist
Haussmann, Hans
Herrmann, Charles R., Supvr., Rocket Design Engr.
Jenkins, H. Powell, Jr., Head, Rocket Research Branch
McLean, William B., Technical Director
Moldenhauer, James G., Physicist
Price, Edward W., Head, Fluid Dynamics Branch
Rutkowski, Eugene V., Rocket Design Engr.
Smith, Bernard, Head, Surface Deapon Div.
Stevens, Lewis A., Physicist, Flight Evaluation Engr.
Weinland, Clarence E., Head, Applied Research Division
Williams, Mary M., Chem. Engr.

NAVAL ORDNANCE TEST STATION, PASADENA

McGuire, Robert W., Engineering Aide
Sinnette, John T., Jr., Consultant Physicist & Research Scientist

NAVAL RADIOLOGICAL DEFENSE LABORATORY, SAN FRANCISCO

Miller, Lewis D., Senior Investigator, Physicist

N. A. B. P. D., SAN BRUNO

Quarterman, Edward A., Commander, USNR

NORTON AFB, SAN BERNARDINO

Browning, Rowland E., Chief, Airframes Section
Cleven, Gale W., Colonel, USAF

OFFICE OF NAVAL RESEARCH, PASADENA

Ewen, Douglas G., Aviation Technical Liaison Officer
McCloskey, Chester M., Chief Scientist

OFFICE OF SCIENTIFIC RESEARCH, A.R.D.C., PASADENA

Jefferson, Kay D., 1st Lt., Research Administrator

ROCKET ENGINE TEST LABORATORY, EDWARDS AFB

Barr, Fay H., Instrumentation Project Coordinator
Buskirk, David E., Lt. USAF, Project Engineer
Capasso, Vincent N., 1st Lt., Performance Engr.
Detjen, Walter A., Project Coordinator
Dynes, Donald L., Chief, Test Operations Branch
Fahey, Philip F., Jr., Chief, Test Eng. Branch
Ford, John P., Chief, Captive Flight Section
Ford, Richard W., Senior Rocket Engine Repairer
Gompertz, Richard F., Chief, Rocket Engine Test Laboratory
Hahn, Milton C., Chief, Inspection Office
Hinchey, John B., Engr. General
Kasper, Victor J., Rocket Eng. Test Lab.
Kistler, Dale E., Project Coordinator
Knappman, Robert D., Equipment Design Engr.
Lawrence, William H., General Engr.
Lieberman, Paul, 2/Lt., Project Engr.
Marshall, John W., Project Engr.
Munden, Robert A., Foreman, Experimental Missile Systems
Porter, Richard N., Engng. Assistant to Chief, Test Operations Br.
Stratton, Harold S., Chief, Propulsion Systems Section
Suzuki, George M., Project Engr.
Watson, Thomas F., Chief Instrumentation
Weiner, Richard S., Test Engr.
Wendt, Carl J., Jr., Project Engr.
Wood, Joseph H., Jr., Civil Engr.

WESTERN DEVELOPMENT DIV., ARDC, INGLEWOOD

Benner, Major Ralph W., USAF
Peabody, Prentice B., Major, USAF
Truax, Robert C., Commander, USN
Vanden Heuve, George R., Major, USAF

SAN BERNARDINO AIR MATERIAL AREA, SAN BERNARDINO

Reale, Richard P., A. F. Q. C. R., Supvr. A/c M. & E.

STATE OF CALIFORNIA, DIVISION OF HIGHWAYS, SAN FRANCISCO

Dewart, Alan C., Assistant Highway Engr.

COLORADO

LOWREY AFB

Calkins, Thomas C., Airman/Third Class
Pittman, Earle S., 3420th STURON

ROCKY MOUNTAN ARSENAL, DENVER

Bradley, Thomas F., Development Engr.

DISTRICT OF COLUMBIA

AIR FORCE HEADQUARTERS

Campbell, Francis W., Assistant for Guided Missiles
Faris, Julius Porter, Jr., Lt. Colonel
Hooks, Daniel E., Brigadier General, USAF
Maloney, Clement G., Special Assistant, Assistant Secretary of the Air Force
Shea, James H., Colonel U.S. Air Force, Res. & Devel. Div.

BUREAU OF AERONAUTICS

Galane, Irma B., Electronics Engr.
Roennau, William H., Engr.
Schneider, Raymond J., Commander, U. S. Navy

BUREAU OF ORDNANCE

Anderson, Frank M., Lt./jg.
Bass, John R., Lt. USN
Reese, John S., Commander, U. S. Navy

CIVIL AERONAUTICS BOARD

Dobi, Nicholas S., Aero. Design, Devel. Research Engr.

DEPARTMENT OF ARMY, OFFICE DEPUTY CHIEF OF STAFF FOR LOGISTICS

Lynch, William J., Lt. Colonel, U. S. Army

DEPARTMENT OF ARMY, ROCKET BRANCH

Hudson, Colin M., Technical Assistant to Chief

DEPARTMENT OF STATE, OFFICE OF INTELLIGENCE AND RESEARCH

Tullock, Gordon, Foreign Service Officer

NATIONAL ACADEMY OF SCIENCES

Schilling Gerhard F., Program Officer

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

Loening, Grover, Consultant
Walker, Curtis L., Aeronautical Research Scientist

NATIONAL SECURITY AGENCY

Crone, John L., Chief, Physical Research Division

NAVAL RESEARCH LABORATORY

Baumann, Robert C., Project Vanguard
Bridger, James M., Head, Vehicle Branch
Comer, Mason R., Jr., Electronics Tech.
Easton, Roger L., Electronic Scientist
Escher, William J. D., Engineering Aide, Vehicles Branch
Foster, Richard W., Project Vanguard
Gibbs, Asa B., Lt. Colonel
Goblirsch, Virgil F., Electronic Tech. (Gen.)
Kupperian, James E., Jr., Physicist
LaGow, Herman E., Physicist
Mazur, Daniel G., Electronic Scientist
Newell, Homer E., Jr., Superintendent
Niles, Allen W., Physicist
Yuen, Joseph N., Electronic Technician
O'Connor, John P., Electrical Engr.
Pressley, Eleanor, Mathematician
Quigley, Charles E., Electrical Engr.
Rosen, Milton W., Head, Rocket Development Branch
Schmadebeck, Louis F., Electronic Technician
Simas, Victor R., Electronic Scientist
Smith, Charles P., Jr., Electronic Scientist
Snodgrass, Richard B., Physicist
Stehling, Kurt R., Rocket Section Head, Vehicle Branch

NAVY HYDROGRAPHIC OFFICE

Clardy, William W., Cartographer

NAVY SPECIAL PROJECT OFFICE

Merrill, Grayson, Capt., USN

OFFICE OF NAVAL RESEARCH

Fortune, William C., Captain
Metsger, Alfred B., Captain, U. S. Navy
Patton, James R., Jr., Mechanical Engr.

OPERATIONS RESEARCH OFFICE

Adams, Hebron E., Operations Analyst

PATENT OFFICE

Bullion, Leroy D., Patent Examiner

U. S. INFORMATION AGENCY

Burks, Sam J., Jr., Foreign Service Officer

FLORIDA

AIR FORCE MISSILE TEST CENTER, PATRICK AFB

Barter, John W., USAF
Gentry, George C., Mechanical Engr.
Howard, Robert W., Project Officer, Mafader Test Team
Norby, Larry D., Cartographic Aide
Reynolds, Capt. Robert H., Chief, Range Control Division
Stell, Robert L., Major, U. S. A. F.
Yasecko, Joseph S., Supervisory Engr.
Yates, Donald N., Major General, USAF, Commander, AFMTC

EGLIN AFB

Jacobs, Donald B., 1st Lt., Project Officer

MARINE CORPS AIR STATION, MIAMI

Rosling, Robert T., PFC, USMC

MIAMI INTERNATIONAL AIRPORT

Healey, William J., Captain, Air Operations Officer

NAVAL AIR STATION, CECIL FIELD, JACKSONVILLE

Wooten, Guy G., Lt., USN, Naval Aviator, Maintenance Officer

ORLANDO AFB

Boverie, Richard T., 1st Lt. USAF, Guided Missile Launch Officer

NAVY MINE DEFENSE LAB., PANAMA CITY

Burgeson, John W., Physicist

SAUFLEY FIELD, PENSACOLA

McMahan, P. Colin, Ensign U.S.N.

GEORGIA

CAMP GORDON

Turner, Alvin F., Instructor in the South East Signal School

HUNTER AFB

Foerster, Wilbert G., USAF

ILLINOIS

CHANUTE AFB

Contable, Alfred F., USAF

FORT SHERIDAN

Boquist, Glen E., Nike Equipment Specialist

O'HARE INTERNATIONAL AIRPORT, CHICAGO

DeAvies, Emmett G., First Lieutenant

ORDNANCE AMMUNITION COMMAND, JOLIET

Lenehan, Arthur E., Supervisory Chemical Engr.
Wall, John V., Program Engr.

ROCK ISLAND ARSENAL, ROCK ISLAND

Meyers, Donald L., Chief Engr.

KANSAS

McCONNELL AFB

Mills, Clarence H., Major
Moffett, Christopher O., Colonel, USAF
Plummer, Louis P., Major

MARYLAND

ABERDEEN PROVING GROUND

Backlund, Carl V., Physicist
Emerick, Bruce D., Proof Director
Hasenfus, Harold J., Chief
Kucher, Volodimir B., Chief, Rocket Flight Section
Quantz, Raoul J., Captain, U. S. Army
Yagi, Fumio, Mathematician

AIR RESEARCH AND DEVELOPMENT COMMAND, BALTIMORE

Feicht, Edward R., Major, USAF

ARMY CHEMICAL CENTER

DeBoy, William H., Major
Kratzer, John L., Chief, Warhead Research Section
Marshall, George H., Assistant Mechanical Engr.
Strouhal, George, Ordnance Design Engr.
Turkeltaub, Jack R., Physicist

CAMP DETRICK

Suddeth, David H., USA

NAVAL AIR TEST CENTER, PATUXENT

de Callies, Richard N., Senior Project Engr.

NAVAL ORDNANCE LABORATORY, WHITE OAK

Galloway, Howard L., Physicist
Watson, John E., Mechanical Engr.

NAVAL POWER FACTORY, INDIAN HEAD

Crooks, John R., Chemical Engr.

MASSACHUSETTS

ARMY CORPS OF ENGRS., BOSTON

Meservey, E. Benson, Structural Engr.

NAVAL SUPERSONIC LAB., M.I.T., CAMBRIDGE

Freeman, Richard W., Jr., Wind Tunnel Engr.

QUARTERMASTER RESEARCH AND DEVELOPMENT CENTER, NATICK

Levin, Alexander, Chief, Supervisory Mech. ngr.

NEW JERSEY

CIVIL AERONAUTICS ADMINISTRATION, UPPER MONTCLAIR

Crunden, Allan B. Jr., M.D., F.A.C.S., CAA Medical Examiner for Air Transport Ratings

FORT MONMOUTH

Golay, Marcel J. E., Chief Scientist
Gray, Foster L., Second Lieutenant
Hall, William W., Jr., Captain

NAVAL AIR ROCKET TEST STATION, LAKE DENMARK

Brandwein, David S., Chief Engr.
Clark, John D., Head, Chemistry Branch
Hickerson, Frederick R., Project Engr.
Menes, Herman C., Chief Engr.

NAVAL AIR STATION, ATLANTIC CITY

Cornwell, Roy S., LCDR

NAVAL AIR STATION, LAKEHURST

Clayton, Richard M., U. S. Navy

ORDNANCE CORPS, BELL TELEPHONE LABORATORIES, WHIPPANY

Loughlin, Robert W., 1st Lt.

PICATINNY ARSENAL

Compitello, Frank E., Ammunition Design Engr.
Kostal, George J., Ordnance Engr.
Nadel, Isidore G., Chemical Engr.

NEW MEXICO

HOLLOMAN AIR DEVELOPMENT CENTER, HOLLOMAN AFB

Bagley, Charles S., Cartographer
Bliss, John T.
Braun, Gerhard W., Aero. Engr.
Butler, Clifton L., Lt. Colonel
Cameron, John L., Chemist
Davis, Leighton I., Brig. General, USAF
Eber, Gerhard R., Tech. Dir.
Gildenberg, Bernard D., R&D Meteorologist
Hagler, Louis H., Electronic Specialist
Hall, Theodore F., 1st. Lt.
Hanrahan, James S., Center Historian
Haubert, Roy A., Electrical Specialist
Heithecker, Heinrich A., Mechanical Engr. (Structures)
Hensley, Maurice L., Mechanical Engr.
Hughen, William E., Chief Chemist
Jaenke, Martin G., Supervisory Electronic Scientist
Jose, Paul D., Chief
Lange, Ernst, Electrical Engr.
Macaaron, Kenneth A., Major, USAF
MacDonald, Hugh J., Guided Missile Design
McCurdy, John A., Electronics Engr.
Mihm, Edward, Eng. Draftsman
Savage, Robert B., Major
Schack, Grover J., Chief
Simons, David G., Chief of Space Biology Branch
Stapp, John Paul, Lt. Colonel, USAF(MC)
Steinhoff, Ernst A., Chief Tech., Analysis Division

SANDIA BASE, ALBUQUERQUE

Uehlinger, A. E., Assistant Field Mgr.

SPECIAL WEAPONS CENTER, KIRTLAND AFB

Dotzler, Herbert C., Airman 2nd Class
Knox, Jonathan H., Colonel, USAF
Zengel, John F. P., Captain

WHITE SANDS PROVING GROUND

Barichivich, Anthony C., Physicist
Becker, Randolph A., Physicist
Bellais, Charles E., D300K Crew Chief
Bonney, Lyle D., Chief, Eng. Small Missiles Range Radar Site
Byrd, Lewis H., Physicist
Campbell, Albert S., Chief, Precision Measurements Laboratory
Cameron, Erwin E., Physicist
Cottler, Dudley M., Assistant Engng.
Davis, Harry S., Mathematician
Dingman, Edward H., Assistant to Branch Chief
Donivan, Henry C., Chief, Engng. Section
Etchells, Joah B., 1st Lt.
Fearn, Ralph F., Propulsion Specialist
Fickes, William H., Electronics Engr., Chief, Systems Evaluation
Gardenhire, Lawrence W., Chief, Instrumentation & Standards Br.
Greetham, Lt. Francis F., USAR
Gregg, David, Deputy Chief
Hancock, William Electronic Engr.
Hielscher, Henry, Laboratory Supervisor
Hinchey, Fred A., Program Plans Coordinator
Hodge, John D., Jr., Laboratory Technician
Hoey, James K., Captain, Ord. Corps.
Holway, James M., Lt. jg, USNR, Assist. Fire Control Officer
Horn, Helmut J., Physicist
Hunter, Bryan J., Electronic Specialist
Johnson, Charles M., Chief, Systems Evaluation Branch
Johnson, Gust E., Electronic Scientist
Johnson, John M., Aeronautical Rocket Power Plant Test Eng.
Karsch, Herbert L., Installation Engr.
Keys, Don D., Chief, Design Branch
Kidwell, Robert P., Physicist
LaBonte, Ernest G., PFC.
Lilley, Hollis B., Electronic Specialist (Instrumentation)
Luboyeski, S. R.

Luchter, Daniel, Electronic Engr., EML Instrumentation
Mansur, Charles W., Chief, Components Test Section, Rocket Power Plant Engr.
Meredith, George L., Electronics Engr.
McAdory, John L., Jr., Electronic Specialist
Moore, F. Donald, Chief, Range Facilities Control Office
Randall, Lowell N., Rocket Power Plant Research Engr.
Perry, Bernard A., Electronics Engr.
Schultheis, Frank, Operations Engr.
Shoppach, Charles E., Physicist
Sheldahl, Louis R., Project Engr.
Smith, Levering, Captain, USN
Smith, William F. C., Electronic Scientist
Starkweather, Frederick T., Mathematician
Stetcher, Lewis J., Jr., Executive Operations Officer
Stine, George Harry, Viking-Aerobee Project Engr.
Strain, John W., Power Plant Engr.
Thompson, Donald, Mathematician
Wagner, Nathan, Assistant Chief Missile Flight Safety Officer
Warren, William H.
Webb, Willis L., Meteorologist
Welch, Chester M., Supervisory Electronics Engr.
Wiss, John W.
Zebrowski, Edward A., Physicist

NEW YORK

BROOKHAVEN NATIONAL LABORATORY, UPTON

Huse, Alfred Karl, Staff Assist. to Area Mgr. on Nuclear Reactors

FIRST ARMY, GOVERNORS ISLAND

Lemnitzer, William L., Graduate Student, Columbia Univ. (Industrial Chem.)

FORT NIAGARA

Olson, Norman O., Electronic Technician, Nike

FORT TOTTEN

Albertson, Benjamin S., SP/2

FORT WADSWORTH

McEwan, Lt. Col. Richard G., Guided Missile Officer

1394 GUIDED MISSILES BATTALION, NEW YORK

Lane, Vincent A., Colonel
Nesmith, James H., Colonel, U. S. Army Reserve

PLATTSBURGH AFB

Demarest, Van Buskirk, Jr., A/2c
McVey, John F.

ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB

Vincent, Joseph G., Chief, Inspection Branch

SPECIAL DEVICES CENTER (ONR), PORT WASHINGTON

Huson, John, Aviation Requirements Head, Guided Missiles

WEATHER BUREAU, LA GUARDIA AIRPORT

Brown, John A., Meteorologist

NORTH CAROLINA

MARINE CORPS AIR STATION, CHERRY POINT

Schaeffer, Emile J., Chief Aeronautical Engr.

NAVAL AUXILIARY AIR STATION, EDENTON

Lawrence, Hamilton, Colonel

OHIO

CLINTON COUNTY AFB, WILMINGTON

Fauster, Joseph F., Flight Engr.

ERIE ORDNANCE DEPOT, PORT CLINTON

Wott, Harold W., Radar Technician

LEWIS FLIGHT PROPULSION LAB., NACA, CLEVELAND

Anderson, Arthur R., Aeronautical Research Scientist
Anderson, William G., Head, Machine Design
Armstrong, Neil A., Aeronautical Research Pilot
Baker, Louis, Jr., Aeronautical Research Scientist
Costilow, Eleanor L., Aeronautical Research Scientist
Diedrich, George, Mathematics Aide
Fortini, Anthony, Aeronautical Research Scientist
Douglass, Howard W., Aeronautical Research Scientist
Feiler, Charles E., Aeronautical Research Scientist
Gordon, Sanford, Aeronautical Research Scientist
Graham, Robert W., Aeronautical Research Scientist
Huff, Vearl N., Head, Rocket Thermodynamics Section
Humphrey, Jack, Research Scientist
Ingebo, Robert D., Aeronautical Research Scientist
Kinney, George R., Aeronautical Research Scientist
Ladanyi, Dezso J., Aeronautical Research Scientist
Lieberstein, Melvin, Aeronautical Research Scientist
Miller, Riley O., Aeronautical Research Scientist
Morell, Gerald, Head, Rocket Combustion Section
Oldrieve, Robert E., Aeronautical Research Scientist
Olson, Walter T., Chief, Fuel & Combustion Research Division
Ordin, Paul M., Chief, Fluid Systems Branch
Rothenberg, Edward A., Aeronautical Research Scientist
Sands, Norman, Aeronautical Research Scientist
Schmidt, Harold W., Aero. Research. Fac. Engr.
Silverstein, Abe, Associate Director
Sloop, John L., Chief, Rocket Branch
Tischler, Adelbert O., Aeronautical Research Scientist
Tomazic, William A., Aeronautical Research Scientist
Useller, James W., Aeronautical Research Scientist
Zappa, Robert Francis, Aeronautical Research Scientist

LOCKBOURNE AFB

Enders, John H., National Advisory Committee for Aeronautics

WRIGHT-PATTERSON AFB

Altiere, Fred J., Major, R&D Administrator
Anderson, Carl A., Capt.
Bell, E. Barton, Aeronautical Engr.
Brill, Jay R., Capt., USAF
Burggraf, Odus R., Assistant Professor
Calhoun, John D., Assistant Professor Mechanical Engr.
Fehrman, Alvin L., Captain, USAF
Clarke, Roderick W., Captain, USAF
Dailey, William A., Engr.
Eide, Ralph M., Project Engr.
Einbinder, Louis Wm., Electronics Engr.
Forbes, Forrest S., Project Engr. (Liquid Rocket Propellants)
Graetzer, Gunther R., Head of Department
Haberman, Eugene G., Assistant Project Engr.
Paiewonsky, Bernard H., 2nd Lieutenant
Stetson, Kenneth F., Aeronautical Engr.
Smith, Richard D., Lieutenant
Worth, Weldon, Chief, Plans & Analysis
Zollinger, Joe E., Capt., USAF, Project Engineer F-86 F/H a/c

PENNSYLVANIA

BUREAU OF MINES, PITTSBURGH

Kuhlman, Gertrude C., Mathematician

FRANKFORD ARSENAL, PHILADELPHIA

Connolly, James A., Jr., Electronic Equipment Specialist
Shinaly, Francis J., Research Advisor

NAVAL AIR DEVELOPMENT CENTER, JOHNSVILLE

Arner, George R., Aeronautical Engr.
Karnow, Paul, Aeronautical Engr.
Ringleb, Friedrich O., Staff Physicist

NAVAL AIRCRAFT FACTORY, PHILADELPHIA

Ivanovic, Nicholas P., Supervisor, Mechanical Engr. GS-14
Mulgrave, Thomas P., Supervisory Aero. Research, Development & Design Engr.

NAVAL AIR EXPERIMENT STATION, PHILADELPHIA

Crane, Fred E., Aero. Gas Turbine Plants Test Engr.

RHODE ISLAND

NAVAL WAR COLLEGE, NEWPORT

Stearns, William Gordon Jr., Commander, U. S. Navy

NAVAL UNDERWATER ORDNANCE STATION, NEWPORT

Skinner, William J., Deputy Chief

TENNESSEE

NAVAL AIR TECHNICAL TRAINING CENTER

Lintelmann, Willy

OAK RIDGE NATIONAL LABORATORY

Meghreblian, Robert V., Senior Research Engr.

TEXAS

AMARILLO AFB

Birchak, Francis J.

ARDC, CONVAIR, FORT WORTH

Clayton, Harry H., Special Assistant, Test Facilities & Operation

FORT BLISS

Bockelman, James F.
Brereton, Thomas B., Specialist Third Class
Carper, Richard D.
Collins, Roger W.
Else, Willis I., Instructor
Geissler, Robert D.
Hall, Wesley L.
Johnson, Ellmar D., Corp.
McDaniel, Charles R., Internal Guidance System Repairman (Nike)
Small, Alvin L., Capt., U. S. Army
Smith, Robert L., instructor
Stirn, Richard J., SP-3, Guided Missile Fire Control System Spec. (Surface to Surface)
Toevs, Frederick C. J., U. S. Army
Whalen, Paul G.

HARLINGEN AFB

Peotter, Gene W.

LACKLAND AFB

Hepburn, Richard L., 2d Lt., USAF, Flying Training Command

SCHOOL OF AVIATION MEDICINE, RANDOLPH AFB

Strughold, Hubertus, Chief, Department of Space Medicine

UTAH

DUGWAY PROVING GROUNDS

Hampel, Viktor E., Technician SP-3

VIRGINIA

F. A. D. T. C., VIRGINIA BEACH

McIsaac, John M., Jr., Lieutenant (junior grade) U. S. Navy

FORT BELVOIR

Malcolm, James E., Chief, Agents and Techniques Section

LANGLEY FIELD, NACA

Champine, Robert A., Aeronautical Research Pilot

NAVAL AMPHIBIOUS TRAINING UNIT, LITTLE CREEK

Hartegen, Carl, Instructor of Tactics

RADFORD ARSENAL, RADFORD

Helbert, William B., Jr., Branch Chief

WASHINGTON

FORT LAWTON

Adams, Robert F., Battalion Operations Officer

FORT LEWIS

Kimball, Curtis Y., Lt. Colonel

McCHORD AFB

Giddings, Ralph L., Jr., Major
Woie, Ardell H., USAF, Mechanic-Aircraft & Engine

WISCONSIN

BERGSTROM AFB

Glander, Frederick L., A/IC

United States Government Personnel Overseas

ADVISORY GROUP FOR AERONAUTICAL RESEARCH AND DEVEL., NATO, PARIS, FRANCE

von Karman, Theodore, Chairman

AIR FORCE APO

Brenkle, Joseph, Lt. USAF, Survey & Computation Officer
Buckel, William L., A-1C
Calhoun, Philip C., Lt. Col., USAF
Dowling, Robert C., Captain, USAF
Eddington, Robert B., USAF
Frazer, Harold E., Captain
Klier, Alexander G., Base Dental Surgeon
Pallo, John G., Chief, Armament Division
Stockton, Leland W., Supervisor Electronic Engr.

ARMY APO

Grunert, Roland E.
Hackett, Charles M.
McMillan, William C., Major, Ordnance Corps., U. S. Army
Marsh, Charles F.

COAST GUARD FPO

MacDiarmid, Donald B., Captain, USCG

MARINE CORPS FPO

Koetsch, Julius F., Major, USMC

NAVY FPO

Belsch, John J., TMC
Booda, Commander, Larry L.
Hartdegen, Carl, III, Executive Officer
Oyer, Karl J., Electronics Technician
Rex, James F., Lieutenant, USN
Shuman, William P., Jr., Lieutenant, U. S. Navy
Sides, John H., Rear Admiral

SHAPE AIR DEFENSE TECHNICAL CENTER, THE HAGUE, HOLLAND

Kellogg, William W.

U. S. HIGH COMMISSIONER FOR GERMANY

Brent, Ira D'Arcy, Chief

Foreign Government Personnel

CANADA

CANADA-UNITED STATES PERMANENT JOINT BOARD ON DEFENCE, OTTAWA

McNaughton, Andrew G. L., Gen., Chairman, Canadian Section

DIRECTORATE OF ARMAMENT DEVELOPMENT, CANADIAN ARMY, OTTAWA

Tippett, William J., Capt., Technical Staff Officer

ENGLAND

BRITISH ARMY

Mycroft, George H.

FRANCE

FRENCH EMBASSY, WASHINGTON

Arnaud, Jean, Assistant Air Attache
Ravaud, Rene R., Commander, Assistant Naval Attache

ITALY

ITALIAN AIR FORCE, ROME

Fiorio, Franco E., Lt. Colonel, Italian Air Force

NETHERLANDS

NETHERLANDS EMBASSY, WASHINGTON

Polak, Henri, Scientific Attache
Van der Hoeden, Alfred, Commander, Royal Netherlands Navy

NORWAY

NORWEGIAN DEFENCE RESEARCH ESTABLISHMENT

Christensen, Hans C., Director

SWEDEN

ROYAL AIR BOARD, STOCKHOLM

Broman, Gunnar E.

SWITZERLAND

SERVICE TECHNIQUE, MILITAIRE, BERNE

Greinacher, Richard, Section Chief

VENEZUELA

VENEZUELAN AIR FORCE, MARACAY

Marquez, Santos A., Engineer

VENEZUELAN BUREAU OF SPECIAL STUDIES, CARACAS

Morales, Gonzalo J.

JET PROPULSION
JOURNAL OF AMERICAN ROCKET SOCIETY
DOMESTIC SUBSCRIBERS

ALABAMA

Alabama Polytechnic Institute, Auburn
Alabama, University of, University
Ayers, Euel, Huntsville
Rohm & Haas Company, Redstone Arsenal Res. Div., Huntsville
Southern Research Institute, Birmingham
Weidner, Hermann, Huntsville
United States Government
AFROTC Publication Depot, Montgomery
ASS Library, Ft. Rucker
ARMVA Library, Ft. Rucker
Air University Library, Maxwell A.F.B.
Redstone Arsenal Ord. Corps., Huntsville
Redstone Arsenal, Technical Library, Huntsville

ARIZONA

Goodyear Aircraft Corp., Litchfield Park
Lowell Observatory, Flagtaff
United States Government
Air Research Center, Phoenix
Air Research Group, Phoenix
Air Research Squadron, Phoenix
9428th Air Reserve Squadron, Tucson
Air Defense Wing-Weapons, Yuma

CALIFORNIA

Aerojet General Corporation, Azusa
Aerojet-General Corporation, Sacramento
Aerophysics Development Corp., Santa Monica
Air Reduction Pacific Co., Vernon
American Machine & Foundry Co., Pacoima
Guy F. Atkinson Co., So. San Francisco
Associated Missile Products Corp., Pomona
Bennett Products Co., Palo Alto
California Inst. of Technology, Jet Propulsion Lab., Pasadena
California Inst. of Technology, Library, Pasadena
Calif. Research Organization, Richmond
California, University of, Library, Los Angeles
California, University of, General Library, Berkeley
Convair, A Division of General Dynamics Corp., Pomona
Convair, A Division of General Dynamics Corp., San Diego
Culver, Frederick J., La Crescenta
Detroit Controls Corp., Redwood City
Douglas Aircraft Co., Inc., Engng. Library, El Segundo
Douglas Aircraft Co., Inc., Long Beach
Douglas Aircraft Co., Santa Monica, Calif.
Douglas Aircraft Co., Inc., Missiles Library, Santa Monica
Douglas Aircraft Co., Inc., Testing Division, Santa Monica
Firestone Tire & Rubber Co., Guided Missile Div., Los Angeles
Hiller Helicopters, Palo Alto
The Hi-Shear Rivet Tool Co., Los Angeles
Hughes Aircraft Co., Culver City
Jennings, Harold E., Jr., Sacramento
Lockheed Aircraft Corp., Burbank
Lockheed Aircraft Corp., Van Nuys
Los Angeles Harbor Junior College, Wilmington
Los Angeles Public Library, Serials Division, Los Angeles
Marquardt Aircraft Co., Van Nuys
North American Aviation, Inc., Canoga Park
North American Aviation, Inc., Downey
North American Instruments, Inc., Altadena
Northrop Aircraft, Inc., Hawthorne
Oakland Public Library, Oakland
Pacific Aeronautical Library, Los Angeles
Pacific Coast Borax Co., Los Angeles
Parker Aircraft Co., Los Angeles
Perna, Vincent F., Altadena
Radiation Laboratory Library, Berkeley
Radioplane Company, Van Nuys
Ramo-Wooldridge Corp., Los Angeles
Rand Corporation, Santa Monica
Rheem Manufacturing Co., Downey
Rishel, Robert L., Sacramento
Robertshaw Fulton Controls Co., Anaheim
Sabersky, R. H., Pasadena
San Diego Public Library, San Diego
San Diego State College, San Diego
San Francisco Public Library, San Francisco
Santa Clara, University of, Santa Clara
Servomechanisms, Inc., Hawthorne
Soundrive Engine Company, Los Angeles
Stanford Research Inst., Menlo Park
Stanford University, Serial Library, Stanford
Statham Laboratories, Inc., Los Angeles
Summers Gyroscope Co., Santa Monica
Union Oil Co. of California, Brea
Lane Wells Company, Los Angeles
Weston Hydraulics, Ltd., No. Hollywood
Wiancko Engineering Co., Pasadena
Wilson, W. H., Long Beach
Zenith Aircraft, Garneda
United States Government
2347th Air Force Reserve Training Center, Long Beach
Clark AF Base, San Francisco
AF Flight Test Center, Edwards AFB
Feamcom Air Base, San Francisco
Itazuke Air Base, San Francisco
Johnson Air Base, San Francisco
18th Air Base Group, Kadena Air Base, San Francisco
NACA, Edwards
NACA, Ames Aeronautical Lab., Moffett Field
Sbamba Library, Norton Air Force Base
U. S. Naval Ammunition Depot, San Francisco
U. S. Naval Air Missile Test Center, Point Mugu
U. S. Naval Ordnance Lab., Corona
U. S. Naval Ordnance Test Station, China Lake
U. S. Naval Postgraduate School, Monterey
U. S. N. O. T. S., Pasadena
Yokota Base Library, San Francisco
13th AF Provisional, San Francisco
49th Fighter Bomb Wing, San Francisco
67th Air Base Group, San Francisco
6048 Air Base Wing, San Francisco
6101st Air Base Group, San Francisco

CONNECTICUT

The American Brass Co., Waterbury
Avco Manufacturing Corp., Stratford
Bridgeport Public Library, Bridgeport
Connecticut, University of, Storrs
Pratt & Whitney Aircraft Corp., So. Windsor
Remington Arms Co., Inc., Bridgeport
RPI, Hartford Graduate School, E. Windsor Hill
United Aircraft Corp., E. Hartford
Yale University, New Haven

COLORADO

Colorado, University of, Boulder
Denver Public Library, Denver
Sundstrand Aviation, Denver
United States Government
Lt. Col. Arthur J. Larsen

DELAWARE

DuPont de Nemours & Co., E. I., Jackson Lab. Library, Wilmington
DuPont de Nemours & Co., E. I., Lavosier Library, Wilmington

DISTRICT OF COLUMBIA

Belgian Military & Air Attache
Catholic University of America
David Taylor Model Basin
French Air Attache
French Military Attache
French Naval Attache
Georgetown University
Italian Air Attache
Italian Embassy
The Italian Military Attache
Kurinia, A.
National Geographic Society

Nicu, Major George
Polish Embassy
Romanian Legation
Seabrook, M. R.
Smithsonian Institution
Spanish Embassy Air Attache
USSR, Embassy of the
United States Government
The Army Library, The Pentagon
American Consulate at Singapore
Assist. Secy. of Defense, Office of
Atomic Energy Commission
Bureau of Aeronautics
Bureau of Ordnance
Central Intelligence Agency
Diamond Ordnance Fuze Labs.
NACA
National Bureau of Standards
Naval Research Lab.
Scientific Library, Patent Office

FLORIDA

Burry, Roger V.
Florida, University of, Gainesville
Pan American World Airways, Inc., Patrick Air Force Base
McAnnally, Lt. John R., Marianna
Wingard, M. G., Jr., Patrick Air Force Base
United States Government
Commander, AF Armament Ctr., Eglin AFB
USAF Tech. Library, Eglin Air Force Base
Naval Air Technical Training Center, Jacksonville
Base Library, Patrick Air Force Base
Base Library, Tyndall AFB

GEORGIA

Foss, H. S., Marietta
Georgia Inst. of Technology, Atlanta
Lockheed Aircraft Corp., Marietta
United States Government
Moody AF Base, Valdosta

ILLINOIS

Argonne National Laboratory, Lemont
Armour Research Foundation, Chicago
R. H. Bacon & Co., Chicago
Barber Colman Co., Rockford
Caterpillar Tractor Co., Peoria
Chicago Public Library, Chicago
Chicago Rawhide Manufacturing Co.
Chicago, University of, Chicago
The John Crerar Library, Chicago
Illinois, University of, Urbana
Inst. of Gas Technology, Chicago
Museum of Science & Industry, Chicago
Northwestern University, Evanston
Parks Air College, East St. Louis
Tebo, Francis J., Berwyn
Television Shares Management Corp., Chicago
United States Government
Chanute Air Force Base
Rock Island Arsenal, Rock Island

INDIANA

Bendix Products Division, Mishawaka
Bendix Products Div., South Bend
Farnsworth Electronics Co., Ft. Wayne
The Public Library of Ft. Wayne & Allen County
Allison Division, General Motors Corp., Indianapolis
Griner, Thomas E., Crawfordsville
Indiana State Library, Indianapolis
Indiana Tech. College, Ft. Wayne
Indiana Technical College, Book & Supply Store, Ft. Wayne
Indiana University, Bloomington
Indianapolis Public Library, Indianapolis
Limbach, Ronald H., Purdue University
Linde Air Products Co., Div. of Union Carbide & Carbon Corp., Indianapolis
Notre Dame, Univ. of, Notre Dame
Purdue University, Lafayette
Rose Polytechnic Inst., Terre Haute
Public Library, South Bend
Standard Oil of Indiana, Seymour
Standard Oil Co., Whiting
United States Government
U. S. Naval Ordnance Plant, Indianapolis

IOWA

Collins Radio Co., Cedar Rapids
Delavan Manufacturing Co., West Des Moines
State University of Iowa, Iowa City

KANSAS

Boeing Airplane Co., Wichita
Kansas State College, Manhattan
Kansas, University of, Lawrence
United States Government
Smoky Hill Air Force Base, Salina

LOUISIANA

Conway, Edward B., New Orleans
Southwestern Louisiana Institute, Lafayette
United States Government
Base Library, Barksdale AF Base, Louisiana
2nd Reconnaissance Technical Sqdn., Barksdale Air Force Base, Louisiana

MARYLAND

Cabot, Benedict J., Baltimore
The Davision Chemical Corp., Baltimore
Brazilian Consulate, Baltimore
Enoch Pratt Free Library, Baltimore
Fairchild Aircraft, Div. of Fairchild Engine & Airplane Corp. Hagerstown
Hercules Powder Co., Inc., Cumberland
The Johns Hopkins University, Baltimore
The Johns Hopkins University, Silver Spring
Maryland, University of, College Park
Thiokol Chemical Corp., Elkton
Vitro Corp. of America, Silver Spring
Westinghouse Electric Corp., Baltimore
United States Government
Tech. Inf. Unit, Aberdeen Proving Ground
Air Res. & Devel. Command, Baltimore
Technical Library, Army Chemical Center
CMLC Med. Lab., Army Chem. Center
Army Security Center, Ft. George G. Meade
Tech. Library, Edgewood Arsenal
Naval Ord. Laboratory, Silver Spring
Naval Powder Factory, Indian Head
U. S. Naval Academy, Annapolis

MASSACHUSETTS

Avco Research Laboratory, Everett
Boston Public Library, Boston
Boston University, Boston
Cambridge Research Center, Bedford
Boston University, College of Industrial Tech., East Boston
General Electric Co., Accessory Turbine Library, W. Lynn
General Electric Co., Aircraft Instrument Eng. Sub. Sect., W. Lynn
General Electric Co., SAE Dept. Library, Lynn
Harvard University, Cambridge
Hycon Eastern Inc., Cambridge
Arthur D. Little, Inc., Cambridge
Mass. Inst. of Technology, Cambridge
Sylvania Electric Products, Inc., Waltham
Technical Operations, Inc., Arlington
United Shoe Machine Corp., Beverly
United States Government
AF Cambridge Research Library, Geophysics Research Library
564th Air Def. Group, Otis AF Base
Watertown Arsenal, Watertown

MICHIGAN

Bendix Aviation Corp., Detroit
Ingersoll Products Div., Borg-Warner Corp., Kalamazoo
Chrysler Corporation, Detroit
Chrysler Corp., Engng. Div., Detroit
Continental Aviation & Eng. Corp., Detroit
Continental Motor Corp., Detroit
Detroit Public Library, Detroit
The Dow Chemical Co., Midland
Ethyl Corporation, Ferndale
Ford Motor Co., Scientific Lab. Library, Dearborn
General Motors, Research Laboratories Div., Detroit
Michigan, Univ. of, Engng. Research Institute, Ann Arbor
Michigan, University of, Ann Arbor
Michigan, University of, Ypsilanti

American Aviation Publications, Inc., Detroit
Vickers Inc., Detroit
Wells, James E., Detroit

MINNESOTA

Diels, Melvin F., Minneapolis
Minneapolis-Honeywell Reg. Co., Minneapolis
Minneapolis Public Library, Minneapolis
Minnesota, University of, Minneapolis
Chu, Wen-Hwa, Minneapolis
Minnesota, University of, Naval Ordnance Research, Minneapolis
Smith, Dale R., Minneapolis

MISSOURI

Applied Mechanics Reviews, Midwest Research Institute, Kansas City
Kansas City Public Library, Kansas City
Linda Hall Library, Kansas City
McDonnell Aircraft Corp., St. Louis
Midwest Research Inst., Kansas City
School of Mines & Metallurgy, Rolla
St. Louis Public Library, St. Louis
Universal Match Corp., St. Louis
Washington University Libraries, St. Louis
Westinghouse Electric Corp., Kansas City

MONTANA

United States Government
  Malmstrom Air Force Base, Great Falls

NEBRASKA

Nebraska, University of, Lincoln
United States Government
  Directorate of Personal Hq., Strategic Air Command, Offutt A.F.B.

NEVADA

United States Government
  Base Library, Nellis AF Base
Childress, John W., Jr., Hawthorne

NEW JERSEY

Air Reduction Co., Inc., Murray Hill
Applied Science Corp. of Princeton, Princeton
Bendix Aviation Corp., Eclipse Pioneer Division, Teterboro
Curtiss-Wright Corp., Wright Aeronautical Div., Wood-Ridge
Du Pont de Nemours & Co., E. I., Burnside Laboratory, Penns Grove
Esso Research & Engineering Co., Linden
Fairleigh Dickinson College, Rutherford
Federal Telecommunication Labs., Nutley
Finn, T. B., Teaneck
Free Public Library, Trenton
The M. W. Kellogg Co., Jersey City
Princeton University Library, Princeton
Radio Corp. of America, Camden
Public Library, Newark
Reaction Motors, Inc., Denville
Wilhelm, Prof. R. H., Princeton
United States Government
  Naval Ammunition Depot, Lake Denmark
  Picatinny Arsenal, Dover
  Signal School Library, Fort Monmouth
  Squier Branch Library, Officers Dept. TSS, Ft. Monmouth

NEW MEXICO

California, University of, Los Alamos Scientific Laboratory, Los Alamos
New Mexico College of A. & M. A., State College
Sandia Corporation Library, Albuquerque
Tierney, Martin, Albuquerque
United States Government
  Armed Forces Special Weapons Proj., Albuquerque
  Tech. Library, Holloman AFB
  Air Force Sp. Weapons Center, Kirkland AFB
  Post Library, White Sands Proving Ground, Las Cruces
  Technical Library, White Sands Proving Ground, Las Cruces

NEW YORK

Airborne Instruments Lab., Mineola
American Machine & Foundry Co., New York
American Bosch Arma Corp., Garden City
Becker, Walter, Syracuse
Bell Aircraft Corporation, Buffalo
Bell Telephone Lab. Inc., New York
Bobrich Products Corp., Beacon
Bombrini Parodi-Delfino, New York
Buffalo & Erie County Public Library, Buffalo
Buffalo, University of, Lockwood Memorial Library, Buffalo
Bulova Research & Development Lab., Inc., Woodside
Carbide & Carbon Chemicals Co., New York
Charol, Edward, Bronx
Coleman, Roger F., Kenmore
Columbia University, New York
Cornell Aeronautical Lab. Inc., Buffalo
Cornell University, Ithaca
Corning Glass Works, Corning
Eastern Research Group, Brooklyn
Fairchild Engine & Airplane Corp., Fairchild Eng. Div., Deer Park
Fairchild Engine & Airplane Corp., Fairchild Guided Missiles Div., Wyandanch
Fairchild Engine & Airplane Corp., Hd., Inertial Systems Lab., Wyandanch
Fairchild Engine & Airplane Corp., Stratos Div., Bay Shore
General Electric Co., A. & O. S. Library, Schenectady
General Electric Co., Guided Missiles Dept., Schenectady
General Electric Co., Spec. Def. Proj. Dept., Schenectady
Gernsback, Hugo, New York
Gilkoff, George Sr., New York
Gillmors, Inc., Hicksville
Graphite Metallizing Corp., Yonkers
Grumman Aircraft Engng. Corp., Bethpage
Hazeltine Electronics Corp., Little Neck
IBM Laboratory, Poughkeepsie
Luce Press Clipping Bureau, New York
Machine Products Co., New York
Maxson Instruments, Long Island City
N. Y. Public Library, New York
New York State Library, Albany
The Norden Lab. Corp., White Plains
Nuclear Development Corp. of America, White Plains
Olin Mathieson Chemical Corp., Niagara Falls
Polytechnic Inst. of Brooklyn, Brooklyn
Rensselaer Polytechnic Institute, Troy
Republic Aviation Corp., Farmingdale
Rochester, University of, Rochester
Sizoo, Wm. M., Chaumont
State University of New York, College of Ceramics at Alfred University, Alfred
Street, G., Jr., Schenectady
Syracuse University, Syracuse
The Texas Company, Beacon
Union Carbide & Carbon Corp., New York
Wei-Hung, Yih, Jamaica
United States Government
  American Embassy, APO 230, N. Y.
  American Embassy, FPO 100, N. Y.
  U. S. Air Attache American Embassy, London, England, New York Postmaster
  Hq. USAFE, IG Technical Library, New York
  Office of Naval Research, New York
  Hq. First Air Force, Mitchell AF Base
  2nd Air Div., New York
  10th Tactical Recon. Wing, New York
  28th Bomb Wing, New York
  47th Bomb Wing, New York
  47th Air Base GP., New York
  48th Fighter Bomb Wing, New York
  50th Fighter Bomb Wing, New York
  66th Air Base Group, New York
  Det. 1, 69th Pilotless Bomb. Sq., New York
  69th Pilotless Bomb. Sq., New York
  Det. 3, 69th Pilotless Bomb. Sq., New York
  Det. 4, 69th Pilotless Bomb. Sq., New York
  81st Fighter Bomber Wing, New York
  86th Ftr. Interceptor Wing, New York
  AF 440 LO 30D-56-158, New York
  AF 591 LO, New York
  602nd AC&W Sq., New York
  Base Library, AF 2171 LO, Wheelers Field
  AF 1889 LO, Sembach Airbase, New York
  3911th Air Base Group, New York
  6606th Air Base Wing, New York
  7030th Hqs. Support GP, New York
  USAFE Library, 7100th Air Base Group, New York
  7221SR Support Sq., New York
  7272 Air Base Wing, New York
  7330th Training Wing, New York

7331 Tech. Training GP, New York
7244th Air Base Group, New York
7413 Air Base Sqdn., New York
7486th Air Def. Gp., New York
Hq. USAFE DCS Personnel, New York

NORTH CAROLINA

Duke University, Durham
United States Government
  USAF Air Ground Oper. Sch., Southern Pines

OHIO

Battelle Institute, Columbus
Canadian Westinghouse, Hamilton
Carnes, James L., Dayton
Case Inst. of Technology, Cleveland
The Standard Oil Co., Cleveland
Public Library of Cincinnati
Cleveland Public Library, Cleveland
Dayton Public Library, Dayton
General Electric Co., AGT Library, Cincinnati
General Electric Co., AGT Development Dept., Cincinnati
General Electric Co., ANP Dept., Cincinnati
General Electric Co., Augmentor Unit, Cincinnati
General Electric Co., JED Library, Cincinnati
General Electric Co., Market Res., Cincinnati
Glawe, George E., Lakewood
Goodyear Aircraft Corp., Akron
Goodyear Tire & Rubber Co., Akron
Kilgore, Inc., Westerville
North American Aviation, Inc., Columbus Division, Columbus
Ohio State University, Columbus
Parker Appliance Co., Cleveland
Thompson Products, Inc., Cleveland
Tinker, W. H., Frankfort
Toledo Public Library, Toledo
United States Government
  NACA, Cleveland
  Ohio River Div. Labs., Corps of Engineers, U. S. Army, Cincinnati
  Air Tech. Intelligence Center, Wright Patterson AFB
  AF 1886 LO, Building 12, Wright Patterson AFB
  OIC Tech. Library, Wright Patterson AFB
  OIC Technical Library, Wright Patterson AFB
  Inst. of Technology, Wright Patterson AFB
  USAFIT Lib., Lab. Area, MCLI-Lab., Wright Patterson

OKLAHOMA

Anderson, Ernest Z., Tulsa
Mitchell, Edwin H., Kingfisher
Phillips Petroleum Co., Bartesville
Tulsa Public Library, Tulsa
United States Government
  Library, TA & GMS, Fort Sill
  Tinker Air Force Base, Oklahoma City

OREGON

Oregon State College, Corvallis

PENNSYLVANIA

Public Library, Altoona
Burroughs Corp., Paoli
Callery Chemical Co., Callery
Carnegie Library of Pittsburgh, Pittsburgh
Daystrom Instrument, Div. of Daystrom, Inc., Archbald
Drexel Institute, Philadelphia
Franklin Institute, Philadelphia
Haller, Raymond & Brown, Inc., State College
Lehigh Univ., Bethlehem
Mellon Institute, Pittsburgh
Pennsalt International Corp., Philadelphia
University of Pennsylvania, Towne Scientific School, Philadelphia
Pennsylvania State College, State College
Pennsylvania State University, Ordnance Research Lab., University Park
Free Library of Philadelphia, Philadelphia
Piaseck Helicopter Corp., Morton
Red Lion Cabinet Co., Redco Tool Div., Red Lion
Toulon, Pierre, Pittsburgh
Trojan Powder Co., Allentown
Westinghouse Electric Corp., Pittsburgh
Westinghouse Research Labs., Pittsburgh
Yang, Denis C., Prospect Park
United States Government
  Frankford Arsenal, Philadelphia
  Naval Air Development Center, Johnsville
  U. S. Bureau of Mines, Pittsburgh
  Aviation Medical Acceleration Labs., Naval Air Development Center, Johnsville
  Naval Air Material Center, Naval Base, Philadelphia

RHODE ISLAND

Librarian, Brown University Library, Providence
Rhode Island, University of, Kingston
United States Government
  U. S. Naval Underwater Ord. Station, Coddington Cove, Newport
  U. S. Naval Underwater Ordance Sta., Middletown

SOUTH CAROLINA

United States Government
  Shaw Air Force Base, Shaw AF Base
  432nd Recon. Tech. Sqdn., Shaw Air Force Base

TENNESSEE

Carbide & Carbon Chemicals Co., Oak Ridge
Tennessee, University of, Knoxville
Union Carbide Nuclear Co., Oak Ridge
United States Government
  ADEC Technical Library, Tullahoma
  355th Fighter Group, Mc Ghee Tyson Airport, Knoxville

TEXAS

Carbide & Carbon Chemicals Co., Texas City
Chance Vought Aircraft, Dallas
Chance Vought Aircraft, Engineering Library, Dallas
Columbia Southern Chemical Corp., Corpus Christi
Convair, A Division of General Dynamics Corp., Ordnance Aerophysics Lab., Daingerfield
Convair, A Division of General Dynamics Corp., Fort Worth
The Dow Chemical Co., Freeport
Lamar Tech., Beaumont
Rice Institute, Houston
Southwest Foundation for Research & Education, San Antonio
Southwest Research Inst., San Antonio
Texas A&M, College Station
Texas, University of, Austin
Texas Instruments, Inc., Dallas
West Texas State College, Canyon
United States Government
  AFL 3095, Bryan AF Base, Bryan
  Base Library, Ellington AF Base
  AA & GM BR TAS, Fort Bliss
  San Antonio Air Matl. Area, Kelly Air Force Base
  USAF School of Aviation Medicine, Randolph Field, Tex.
  AF PERS. & TNG RES CENT., Lackland Air Force Base, San Antonio

UTAH

Utah, University of, Salt Lake City
United States Government
  Dugway Proving Ground, Dugway
  Ogden Air Matl. Area, Hill AFB

VIRGINIA

Atlantic Research Corporation, Alexandria
Greiner, Leonard, Richmond
Melpar, Inc., Falls Church
O'Neil, Hugh, Richmond
Virginia Polytechnic Institute, Blacksburg
Virginia, University of, The Alderman Library, Charlottesville
United States Government
  Guided Missile Training Unit 11, Chincoteague
  NACA, Langley Field, Hampton
  NACA, West Library, Langley Field
  N.A.O.T.S., Chincoteague
  Naval Proving Ground, Dahlgren

VERMONT

Best, William D., Burlington
United States Government
  75th Air Base Squadron, Fort Ethan Allan

WASHINGTON

Boeing Airplane Co., Seattle
General Electric Co., Seattle
Gonzaga University, Spokane
Lewe, Chong K., Walla Walla
Public Library, Seattle
Sheldon, Gerald D., Shelton
Washington, University of, Seattle
United States Government
  Base Library, Larson AF Base
  Puget Sound Naval Shipyard, Technical Library, Bremerton
  5039th Maint. & Supply Group, Seattle

WEST VIRGINIA

Food Machinery & Chemical Corp., Westvaco Chlor-Alkali Div., South Charleston
Westvaco Chlor-Alkali Div., Research Dept., South Charleston
West Virginia University, Morgantown

WISCONSIN

AC Spark Plug Division, Milwaukee
Fularczyk, August, Milwaukee
Pressed Steel Tank Co., Milwaukee
Ladish Co., Cudahy
Cleaver-Brooks Co., Milwaukee
Milwaukee Public Library, Milwaukee
Wisconsin, University of, Memorial Library, Madison

WYOMING

Wyoming, University of, Laramie

JET PROPULSION
JOURNAL OF AMERICAN ROCKET SOCIETY
FOREIGN SUBSCRIBERS

ALGERIA
Center Interarmee d'essais des Engines Speciaux, Algiers

ARGENTINA
Circulo de Aeronautica, Biblioteca Nacional de Aero, Buenos Aires
I.A.M.E. Instituto Aerotecnico, Biblioteca, Oficina de Correos, Cordoba
Inst. Inv. Cientificas, Acassuso
National de la Engergia Atomica, Biblioteca de la Direccion, Buenos Aires

AUSTRALIA
Adelaide University, Adelaide
Aeronautical Research Labs., Melbourne
C.P.R.L., Propulsion Div., Adelaide
Defence Standard Laboratories, Melbourne
English Electric Co., Ltd., Salisbury
Patent Office, Canberra
R.A.A.F. Printing & Publications Unit, Melbourne
Stalker, R. L., Dimboola
Weapons Research Establishment, Adelaide
Wells, C., Hillcrest

AUSTRIA
Deuticke, Franz, Wien

BELGIAN CONGO
DiSan, M. G., Kivu

BELGIUM
Ateliers de Constructions Electriques de Charleroi, Service Documentation, Charleroi
Bibliotheque Centrale, Universite Libre, Bruxelles
Faculte Polytechnique de Mons, Mons
Ministere de la Defense Nationale, Bibliotheque, Bruxelles
Office International de Librarie, S.P.R.L., Bruxelles
Poudreries, Reumis, D. E., Bruxelles
S.A.R.C.A. Economat, Haren
Vandenkerckhove, Jean, Brussels

BRAZIL
Centro Tecnico de Aeronautica, Sao Paulo
Neto, Julio, Rio de Janeiro

CANADA
Avro Aircraft, Ltd., Toronto
Canadair Limited, Montreal
Canadian Armament Research & Development Establishment, Quebec
Canadian Army Staff College, Librarian, Kingston
Canadian Arsenals Ltd., Quebec
Canadian Industries, 1954, Ltd., McMasterville
Canadian Pratt & Whitney Aircraft Co., Montreal
Canadian Westinghouse, Hamilton
Defence Scientific Information, Ottawa
DeHavilland Aircraft of Canada, Ltd., Toronto
Holwerda, M., Montreal
International Civil Aviation Organization, Montreal
L'Air Liquide, Montreal
McGill University, Library, Montreal
National Research Council, Library, Ottawa
Norton Company, Chippawa
Orenda Engines Ltd., Library, Toronto
RCAF Station, Clinton
RCA Victor Co., Library, Montreal
Roe, A. V., Canada Limited
Roe, A. V., Canada Limited, Toronto
Toronto, University of, Toronto

CHINA
B.A.I., Technical Library, Taichung
Chinese Naval College Technology, Taiwan
Commercial Press Ltd., Hong Kong
National Taiwan University, Taipei
Ordnance Research Inst., Taipei

CZECHOSLOVAKIA
Orbis, News Agency, Praha

DENMARK
Forsvarets, Krigsmaterielforvaltning, Copenhagen
Soartilleriet, Copenhagen

EGYPT
Librairie de la Renaissance, Cairo

ENGLAND
A.C.S.I.L., Library Admiralty, London
Aeronautical Res. Council, National Physical Lab., Middlesex
Armstrong Siddeley Motors, Ltd., Warwicks
Blackwell, B. H., Ltd., Oxford
Borax Consolidated Ltd., London
British Oxygen Co., Ltd., London
City & Guilds College, Librarian, London
College of Aeronautics, Librarian, Bucks
Collier, G. J. T., Coventry
Columbine Works, East Cowes
DeHavilland Engine Co., Ltd., Library, Middlesex
DeHavilland Propellers Ltd., London
Edgbaston University, Library, Birmingham
Elliott Brothers, London, Ltd., Hertfordshire
English Electric Co., Ltd., Luton Bed
English Electric Co., Ltd., Librarian, Warton
English Electric Co., Ltd., Librarian, Whetstone
Fairey Aviation Co., Middlesex
George Godfrey & Partners, Ltd., Middlesex
Hawker Aircraft, Ltd., Middlesex
Imperial Chemical Industries, Ltd., Library, Kidderminster
Imperial College Science & Tech., Dept. Chem. Eng., London
Joseph Lucas, Ltd., Burnley
Joseph Lucas, Ltd., Warwickshire
Loughborough College of Technology, Librarian, Loughborough
Ministry of Supply, Armament Res. Est., Kent
Ministry of Suply, Librarian E.R.D.E., Essex
Ministry of Supply, N.G.T.E., Hants
Ministry of Supply, Eng. R.D., Admin., London
Ministry of Supply, R.A.E., Hants
Ministry of Supply, R.A.E./R.P.D., Bucks
D. Napier & Son, Ltd., London
D. Napier & Son, Ltd., Luton
Patent Office Library, London
Pearce, Mr., Middlesex
Plessey Co., Ltd., Library, Essex
R.A.F. Technical College, Henlow Beds
Reference Library, Birmingham
Roe, A. V., Ltd., Weapons Research Div., Woodford
Rolls-Royce, Ltd., Librarian, Derby
Rowe, P., South Ascot
Shell Research, Ltd., Thornton Research Centre, Chester
Synek, Frank, London
Technical Reference Library, Liverpool
Vickers Armstrongs Aircraft, Ltd., Weybridge
Vickers Armstrong, Ltd., Supermarine Works, Hants
Von Fraumhofer, J. A., London
W. G. Armstrong Whitworth Aircraft, Armament Division, Banington, Near Coventry

FINLAND
Juhani Rinne, Helsinki
Sotatieteellinen Keskuskirjasto, Helsinki
Teknillisen Kopkeakoulun Kirjasto, Helsinki

FRANCE
Atelier de Construction de Puteaux, Puteaux, Seine
Ateliers de Fabrication D'Armes de Levallois, Levallois Perret, Seine
Avions Marcel Dassault Saint Cloud (Seine et Oise)
Ban, Diep Gia, Paris
Barrere, M., Massy, (Seine & Oise)
Bureau des Engins Speciaux, Paris
Centre d'Etudes du Bouchet, LeBouchet par Vert le Petit, (Seine et Oise)
Centre d'Experimentation Aerien, Bretigny-Sup-Orge, (Seine et Oise)

Centre Essais en Vol, SDIT, Marignane, (BduR)
Centre Essais Moteurs et Helices Sdit, Sachey Par Jouy en Josas, (Seine et Oise)
Chimie & Propulsion, Toulouse Montaudran, (HTE Garonne)
Cnet. Bibliotheque Locale Piece, Issy les Moulineaux
C.N.R.S., Paris
Comite d'Action Scientifique, Defense Nationale, Paris
Base Aerienne 706, Cazaux (Gironde)
Direction des Etudes et Fabrications d'Armement, Saint Cloud, (Seine et Oise)
Ecole Nationale Superieure, de Mecanique et d'Aerotechnique, Poitiers
Etablissements d'Experiences, Technique de Versailles, Versailles (Seine et Oise)
Etat Major de L'Armee, Section Scientifique & Technique, Paris
Etat-Major General de L'Arme de L'Air, Paris
Fischhoff, M., Vincennes, Seine
Fonderie de Ruelle, Ruelle, (Charente)
Inst. de Recherches de la Siderurgie, I.R.S.I.D., St. Germain-en-laye, (Seine et Oise)
Institut Francais du Petrole, Paris
Klein, Claude A., Paris
Laboratoire de Recherches de Saint Louis, (Haut Rhin)
Laboratoire Drivomatic, Paris
L'Air Liquide, Paris
Le Capitaine de Vaisseau, Chef du 2EME Bureau de L'Etat, Gen. de la Marine, Paris
Ministers des Forces Armees, Paris
O.N.E.R.A. Chalais-Meudon, (Seine et Oise)
O.N.E.R.A., Chatillon-Sous-Bagneau
Poudrerie de Saint Medard, St. Medard en Jalles, (Gironde)
Secretariat d'Etat a la Guerre, Laboratoire de Recherches Ballistiques et Aerodynamiques, Vernon, (Eure)
S.E.P.R., Villejuif, Seine
Service de Documentation Et d'Information Tech. de l'Aeronautique, Paris
Siestrunck, M., Paris
S.N.C.A.S.E., Cannes
S.N.C.A.S.O., Chatillon Sous Bagneux, Seine
S.N.E.C.M.A., Paris
Societe d'Electro-Chimie, Paris
Societe Generale de Mecanique, Aviation Traction, Boulogne Sur Seine
Ste. Nouvelle des Etbs. Brandt, Paris
Vailhe, Louis, St. Georges, (Seine et Oise)
Verdier, M., Paris

FRENCH WEST AFRICA
Institut des Hautes Etudes, Ecole des Sciences, Dakar

GERMANY
Bayerische Motoren Werke, Fur Triebwerksbau, G.M.B.H., Munchen
Bibliothek der Technischen, Aachen
Bibliothek der Technischen, Berlin
Bibliothek der Technischen Hochschule, Hannover
Bibliothek der Technischen Hochschule, Munchen
Bolkow, Ludwig, Stuttgart
Daimler-Benz, A. G., Stuttgart
Ernst Heinkel Motorenbau, G.M.B.H., Harlsruhe, Stuttgart
Forschungsinstitut Fur Physik, Stuttgart
G.M.B.H., Weinheim
Hofman, Hans, Karlsruhe
Hoz, Heinz, Eschen
Lachner, Munchen
Niedersachsische Staats-und Universitatsbibliothek, Gottingen
Papierfabrik Scheufelen, Obervenningen
Peppmuler, Robert, Gottingen
Petters, W., Stuttgart
Physikalisch Technische Bundesanstait, Braunschweig
Press und Stanzwerk, Aktiengesellschaft, Eschen
Staab, Fritz, Reichenbach Fils
Technicschen Hochschule, Stuttgart
Westdeutsche Bibliothek, Marburg-Lahn
Wissenschaftliche Buchhandlung, Kiepert, Berlin

GREECE
Royal Hellenic Air Force, Athens

HUNGARY
Kultura, Budapest

INDIA
Defence Science Organization, Ministry of Defence, New Delhi
Insdoc, National Physical Lab., New Delhi
Institute of Armament Studies, Poona
Office of Dir. Gen. of Civil Aviation, New Delhi
Res. & Development Tech. Centre, Civil Aviation Dept., New Delhi

INDONESIA
Toko Buku Pembimbing, Djakarta

IRELAND
Castlereagh Factory, Belfast

ISRAEL
Dept. of Aeronautical Engng., Haifa
Haifa Technical High School, Haifa
Hebrew Inst. of Technology, Haifa
Koppel, B., Tel Aviv
Makowsky, A., Haifa
Weizmann Inst. of Science, Rehovoth

ITALY
Accademia Navale, Livorno
Comando in Capo Del Dipartimento Marittimo, Taranto
Commissione Permanente, Marina Militare, La Spezia
Consoglio Nazionale della Richerche, Rome
Centraves Italiana S.P.A., Rome
Centro Studi Propulsione a Reazione, Rome
Della Facolta D'Ingegneria, Palermo
Dell Scuole D'Applicazione D'Arma, Torino
Dell Squadra Navale, Taranto
Emilio, Pocai, Viareggio
Fiat—Gestione Macchine Utensili, Modena
Fiat S.P.A., Torino
Giordano, Pietro, Rome
Instituto Di Aeronautica, Milano
Instituto Di Tecnologia Dei Materiali Dei Motori, Rome
Instituto Motori D'Aviazione, Rome
Lab. Meccanca Applicata, Torino
Leberia Deperro Per A.A., Napoli
Marconi Italiana Soc. P. Az., Genova
Marina Militare, Taranto
Ministero Difesa Aeronautica, Centre Consultavo Studi e Recerch Rome
Ministero Difesa-Aeronautica Direzione General Della Armi e Munizioni, Rome
Ministero Difesa Aeronautica Direzione Generale Della Costruzi, Degli Approvvigionamenti, Rome
Nuzzi, Pasquale, Chieti
Salvatore, Gaetano, Rome
Scuela Ingegneria, Biblioteca, Pisa
Societa Microlambda Stabilimento Del Fusaro, Napoli
Soc. Montecatini Sett. Cloronitroderivati, Milano
Soc. S.B.G., Torino
Spett. Ispettorato Artiglieria, Rome
Stato Maggiore & Aero. Militare, Rome
Stato Maggiore Della Marina, S.I.O.S., Rome
Stato Maggiore Escercito, Rome

JAPAN
Andoh, Nario, Tokyo
Booei-Cho, Kooku Bakuryo-Kanbu, Tokyo
Fuji Jukogyo K. K., Tokyo
Fuji Precision Machinery Co., Ltd., Tokyo
Fuji Seimitsu Kogyo K. K., Tokyo
Japan Aeronautic Assn., Tokyo
Japan Publications Trading Co., Tokyo
Kawakaki Kokuki Seisakusho Ltd., Inaoo-Gun Gifu
Kogyo-Gijutsu-In, Tokyo
Komatsu Seisakusho Gijutsubu, Tokyo
Kyushu University, Research Inst. of Industry & Science, Fukuoka-Shi
Maruzen Co., Ltd., Kyoto
Mitsubishi Shipbuilding & Engng. Co., Ltd., Nagasaki City
Mitsubishi Zosen K. K. Gijitsu-Bu, Tokyo
Nagoya Univ., Library, Nagoya
Nakamura, Marumi, Chibaken
National Aeronautical Lab., Tokyo
National Safety Agency, Tokyo
Nihon Jet Engine Co., Ltd., Tokyo
Nihon, Victor, K. K., Yokohama
Ohimiya-Fuji-Kogyo K. K., Saitama-Ken
Omiya-Seisakujo, Saitama-Ken
Tanazawa, Yasushi, Sendai
Tech. Res. Inst. of Nat'l Safety Agency, Tokyo
Tokyo Daigaku Kogaku-Bu, Tokyo
Tokyo Inst. of Technology, Tokyo
Tokyo University, Tokyo
Tokyo, University of, Chiba-Ken
Tokyo, University of, Department of Aeronautics, Tokyo
Usis Presentation, American Embassy, Tokyo

LIBERIA
Liberia Mining Co., Ltd., Monrovia

NETHERLANDS, THE

Bibliotheek En Documentatie, Schiphol
Blommaert, N. V. J., Roosendall
Curtiss-Wright Europa N. V., Amsterdam
Groothoff, C., Delft
Hoofd Techn. Documentatie Centrum Voor De Krijgmacht, Gravenhage
Koninklijke Shell Laboratorium, Delft
Ministry of War, Bureau Documentation, Hague
National Luchtavaart Laboratorium, Amsterdam
Technisch Centrum V. D. Luchtverdeddging, Hague
Technische Hogeschool Lab V Verbrandingsmotoren, Delft

NORWAY

Forsvarsstaben, Oslo

ROUMANIA

Biblioteca Academiei R.P.R., Procurarea Publicatiilor, Bucarest

SCOTLAND

Imperial Chem. Ind., Ltd., Stevenston
John Smith & Son, Glasgow, Ltd., Glasgow
Glasgow, University of
Wallace & Son, Saltcoats

SIAM

Educational Supply Asoc. Co., Bangkok

SPAIN

C.E.T.M.E., Madrid
Instituto Naconal De Tecnica Aeronautica, Madrid
La Sierra, Manuel, Sevilla
Talleres, B. K., Madrid

SWEDEN

A. B. Bofors, Library, Bofors
Backman, Torsten, Trollhattan
Chalmers University of Technology, Library, Gothenburg
Flygforvaltningen, Robotvapenbyran, Stockholm
Flygtekniska, Forsoksanstalten, Bromma
Forsvarets Fabriksverk, Eskilstuna
Forsvarets Fabriksverk Centrala Torpedverkstaden, Motala
Forsvarets Fabriksverk Akers, Akers
Forsvarets Forskningsanstalt, Stockholm
Forsvarets Forskiningsanstalt, Sundbyberg
Institutionen for Flygieknik, tSockholm
KGL. Flygforvaltningen Materialvdelningen, Stockholm
Kingl Flyforvaltningen Forsokscentralen, Malmslatt
K. Teknicka Hogskolans Bibliotek, Stockholm
Kungl. Armetygforvaltningen, Stockholm
Kungl. Krigshogskolan, Stockholm
Lindstahls Lilla Boklada, Stockholm
Marinforvaltningen, Biblioteket, Stockholm
Overingenjor G. Gudmunsson, Trollhattan
Svenska Aeroplan AB, Linkoping
Svenska Flygmotor A. B., Trollhattan

SWITZERLAND

Freihofer, H., Buvhhandlung Fur Technik Und Wissenschaft, Zurich
Halder, Dr., Chur
Hispano Suiza S. A., Geneva
Schaltegger Buchhandlung Fachbuch-Vertrieb, Bahnhofstrafie
Zahn, Willy, Zuerich

THAILAND

Thai Air Force Works, Bangkok

URUGUAY

Facultad De Ingenieria Biblioteca, Montevideo

USSR

Akademii Nauk, Biblioteka, Stalinabad
CNT Biblioteka, Mashinostroenija, Moscow
Dom Uchenykh, Galvnyj Pochtamt, Moscow
Filial Biblioteki, Akademii Nauk SSSR, Moscow
Filial Gosudarstvennoij, Nauchnoij Biblioteki, Moscow
Fiziko-Khim Institut, Galvnj Pochtamt, Moscow
Gos. Nauchn. Biblioteka, Minist. Kultury SSSR, Moscow
Gosudarstvennaja Biblioteka, SSR im. Lenina, Moscow
Inoiziat, Glavnij Pochtamt, Moscow
Inst. Mekhaniki, Glavnyj Pochtamt, Moscow
Ministerstvo, Aviapromyshlennosti, Moscow
Noskovskoje Otdelenije, Biblioteki Akad. Nauk, Moscow
Neftjanaja Biblioteka, Moscow
Technich. Biblioteka, Glavnyj Pochtamt, Moscow

YUGOSLAVIA

Jugoslovenska Knjiga, Beograd
Tehnicki Faultet, Knjiznjica, Zagreb
Zagrebacko Knjizarsko Produzece, Zagreb

Please give the attached application form to someone you feel would be interested in ARS membership.

AMERICAN ROCKET SOCIETY

500 Fifth Ave., New York 36, N. Y.

A national association for the advancement of rocketry, jet propulsion, and astronautics

Aims and Functions

THE AMERICAN ROCKET SOCIETY is a national association of engineers and scientists devoted to "the development and application of the principle of jet propulsion as applied to rockets, aircraft, water and underwater craft and to all other appropriate and practical devices" and to "the development of the sciences and engineering techniques pertaining thereto" such as instrumentation, guidance and control, high temperature materials, upper atmospheric research, aerodynamics, structures, combustion, fuels and propellants, heat transfer, etc. ARS has always maintained a deep interest in responsible scientific study of space flight and in fostering sound professional and public interest in this subject. The Society carries out its aims through:

1. Section Meetings, held periodically at most of the centers of rocket and jet propulsion activity throughout the country. Sections are self-governing and programs are both technical and social.
2. Regional Meetings, which include technical sessions as well as field trips to rocket, guided missile and aircraft establishments, observatories, etc. These meetings are often held in cooperation with other technical societies.
3. The Annual ARS Convention. Held in conjunction with the ASME Convention, this gathering includes technical sessions during which original papers are presented on all aspects of the Society's interests. Outstanding guest speakers are presented at luncheon and dinner meetings and the ARS Awards are presented. Awards include the Robert H. Goddard Memorial Award for work in liquid propellants, the C. N. Hickman Award for solid propellants, the James H. Wyld Memorial Award for outstanding application of rocket power, the ARS Astronautics Award for contribution to the advance toward space flight, the G. Edward Pendray Award for rocket and jet propulsion literary effort, and the ARS Student Award for the best student paper on rocket and jet propulsion. Fellowships are also presented at this meeting to leading figures in the field.

The ARS Library, located in New York, contains historical as well as current material relating to rocket progress.

An affiliation exists between the American Rocket Society and the American Society of Mechanical Engineers which permits ARS members to use the Engineering Library in New York, attend ASME Sectional and National meetings and allows the purchase of reprints of articles at member rates.

History and Accomplishments

ARS was organized on March 21, 1930. During its early years, experimental rocket firings were made, and from them evolved data and equipment which led to the development of several significant rocket engines, as well as to the formation of industrial enterprises which today hold distinguished places in the field.

As progress in rocket and jet propulsion became more rapid, and demands from the military mounted, the Society devoted itself exclusively to dissemination of information through meetings and publications.

Dr. Robert H. Goddard was one of the early members of the society, as were many other pioneers who now hold key positions in industry, science, education and government.

Membership

Four types of membership are open in the society:

MEMBER: Members shall consist of engineers and scientists who are actively engaged in the development or application of rocket or jet propulsion, other persons who have been working on the development or application of rocket or jet propulsion for at least four years and who hold or have held responsible positions in these fields, and such persons as may be deemed eligible for this class of membership by the Board of Directors by virtue of their outstanding accomplishments in other fields and their unusual interest in the purposes of the Society.

ASSOCIATE MEMBER: Associate members shall be persons, other than students, who are actively interested in the development or application of rocket or jet propulsion.

STUDENT MEMBER: Student members shall be persons not less than 17 years of age whose principal occupation is study at a recognized educational institution or who are serving as enlisted personnel in the Armed Forces of the United States, and who are interested in the development or application of rocket or jet propulsion.

CORPORATE MEMBER: Corporate Members shall be educational, scientific or industrial organizations who may choose this method of expressing their interest in the development or application of rocket or jet propulsion, and who are considered acceptable by the Board of Directors. Each Corporate Member shall be entitled to five representatives with the rights and privileges of Members.

Subscriptions to the Journal without membership are available at the rate of $12.50 per year.

Certificates of membership are sent to each member upon acceptance. Identification pins may be purchased for $2.00 from the office of the Secretary.

Publications

JET PROPULSION, Journal of the American Rocket Society, is published monthly and mailed to all members. Edited by distinguished scientists, the Journal is recognized as the most complete and authoritative source of original technical material on rocketry, jet propulsion, astronautics, and allied sciences.

It also includes feature articles on industry, government, and university activit es, news items, and ARS happenings. It carries a calendar of coming meetings, a digest of books and articles published on rocket and jet propulsion in this country and abroad, and reviews by authorities on current books.

Information on advertising rates for the Journal can be obtained from the Secretary.

BOOKS AND TECHNICAL PAPERS. The Society makes available to its members at special rates, technical papers, reprints and other useful information bearing on jet propulsion, rockets and their application. It also has available back issues of the Journal and its predecessor, Astronautics.

A list of such material currently available may be obtained by writing to the office of the Secretary

PLEASE USE FORM ON REVERSE SIDE TO APPLY FOR MEMBERSHIP

APPLICATION FOR MEMBERSHIP • AMERICAN ROCKET SOCIETY

To the Membership Committee:

FOR OFFICE USE ONLY
No.
Adm.
Ref.
Cert.

I hereby apply for membership in the American Rocket Society, Inc. and enclose $......... as my annual membership dues, $5.00 of which is for a year's subscription to the Journal of the American Rocket Society. The information given herewith is correct to the best of my knowledge.

Check type of membership desired

☐ MEMBER—Annual Dues $15.00

☐ ASSOCIATE MEMBER—Annual Dues $10.00

☐ STUDENT MEMBER—Annual Dues $5.00

Date........................

Signature in Full..
(Sign with pen—Do not use initials)

(PLEASE PRINT OR TYPE)

PERSONAL INFORMATION

Name.. Title....................................

Organization..

Services or products of organization...

Your duties and responsibilities...

....

Organization Address... ☐

Home Address.. ☐

Check Address for Society Mail

Age.......... Date of Birth...................... Country of Birth..................... Citizen of......................

Other Technical Organization Memberships...

....

EDUCATIONAL RECORD

Secondary School.. Date.........................

College or University... Date.........................

Major Subject.............................. Degree Received.................. Date.........................

Names of other Technical Schools or Colleges...

Additional Degrees.......................... By Whom Conferred.............. Date.........................

REFERENCES (Name three and include addresses)...

....

....

....

PROFESSIONAL RECORD

DATES: From	To	Names and addresses of past employers. Your positions, duties and responsibilities.

(If space is inadequate add supplementary sheet of this size)